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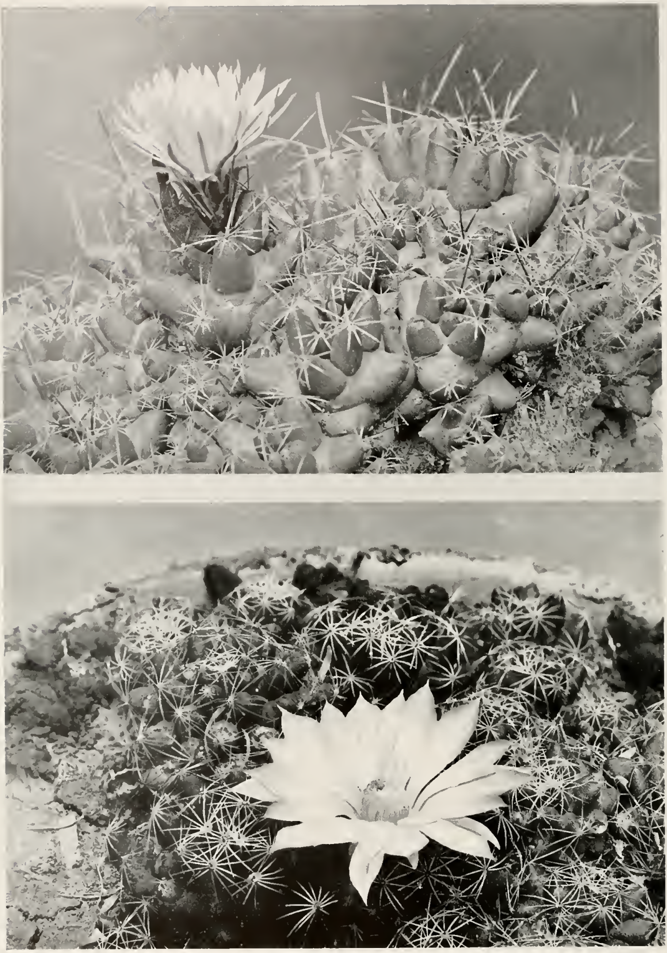

Coryphantha runyonii.
Dolichothele sphaerica.

THE CACTACEAE

DESCRIPTIONS AND ILLUSTRATIONS OF PLANTS OF THE CACTUS FAMILY

BY

N. L. BRITTON AND J. N. ROSE

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THE CACTACEAE

Descriptions and Illustrations of Plants
of the Cactus Family

DESCRIPTIONS AND ILLUSTRATIONS OF PLANTS OF THE CACTUS FAMILY.

Tribe 3. CEREEAE.

Subtribe 6. CORYPHANTHANAE.

Terrestrial, spiny, low cacti, mostly globose, sometimes cylindric, rarely elongated, 1-jointed, solitary or cespitose, tuberculate, the tubercles numerous; tubercles usually arranged in spirals; juice watery or milky; flowers always solitary at areoles, either at top or side of plant, but never at spine-areoles, large or small, regular (except in the genus *Cochemiea*); ovary naked or bearing a few scales; fruit a green or red indehiscent berry (except in the genus *Bartschella*); seeds small, brown or black.

We recognize 14 genera.

KEY TO GENERA.

A. Ovary more or less scaly (not known in *Mamillopsis*).
  Flower campanulate with short tube.
    Some of spines hooked .... 1. *Ancistrocactus* (p. 3)
    None of spines hooked (see species No. 2 in *Neolloydia*).
      Tubercles not deeply grooved; fruit scaly .... 2. *Thelocactus* (p. 6)
      Tubercles deep grooved; fruit nearly naked .... 3. *Neolloydia* (p. 14)
  Flower-tube elongated, scaly .... 4. *Mamillopsis* (p. 19)
AA. Ovary naked or nearly so.
  B. Flowers irregular .... 5. *Cochemiea* (p. 21)
  BB. Flowers regular.
    C. Flowers central, borne in axils of young, usually nascent, tubercles, large (except in genus No. 8); tubercles containing a watery juice; fruit dull green or red; seeds brown or black.
      D. Tubercles grooved on upper side; flowers borne at base of groove.
        Seeds mostly light brown; fruit greenish or yellowish even when mature, ripening slowly .... 6. *Coryphantha* (p. 23)
        Seeds black to dark brown; fruit red, maturing rapidly.
          Tubercles long, not numerous, not persisting as woody knobs; aril of seed large .... 7. *Neobesseya* (p. 51)
          Tubercles short, numerous, persisting after spines fall off as woody knobs; aril of seed small .... 8. *Escobaria* (p. 53)
      DD. Tubercles not grooved above.
        Fruit circumscissile; tubercles fleshy; spines acicular .... 9. *Bartschella* (p. 57)
        Fruit not circumscissile; tubercles woody; spines pectinate .... 10. *Pelecyphora* (p. 59)
    CC. Flowers lateral, borne in axils of old and mature tubercles; these never grooved above.
      Seeds with a large corky aril .... 11. *Phellosperma* (p. 60)
      Seeds without a corky aril.
        Flowers large with an elongated tube; tubercles elongated, flabby .... 12. *Dolichothele* (p. 61)
        Flowers small, campanulate; tubercles not flabby.
          Hilum of seed large; tubercles lactiferous; spines pectinate .... 13. *Solisia* (p. 64)
          Hilum of seed minute; tubercles sometimes lactiferous, but not in species with black seeds; spines not pectinate .... 14. *Neomammillaria* (p. 65)

1. ANCISTROCACTUS gen. nov.

Small, globular or short-cylindric plants, indistinctly ribbed, strongly tubercled, very spiny, one of central spines always hooked; flowering tubercles more or less grooved on upper side; flowers rather small, short, funnelform, borne at top of plant; ovary small, bearing a few thin scales, these always naked in their axils; fruit oblong, greenish, juicy, thin-walled, usually naked below but with a few broad cordate, thin-margined scales above; seeds globular, rather large, brownish to black, the papillae low, flattened; hilum large, depressed, sub-basal, surrounded by a thick rim.

Type species: *Echinocactus megarhizus* Rose.

Engelmann in describing *Echinocactus scheeri*, one of the species of this genus, refers to its anomalous characters when he says:

"Seeds are large, about 1 line long, 0.8 line in diameter, with very minute and flattened tubercles, *brown* (the only *Echinocactus* with seeds of that color known to me;) hilum large and circular, surrounded by a thick rim; albumen very small; embryo curved but cotyledons small, connate, more like those of a *Mammillaria* separating on the curvature and not at the end of the hook, as in all other hooked embryos of *Cactaceae* known to me." (Cact. Mex. Bound. 19. 1859.)

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The generic name is from the Greek, meaning fish-hook, and from the Greek, meaning cactus, referring to the long, hooked central spines.

Ancistrocactus was used by Schumann for a subgenus of *Echinocactus.* We recognize three species in the genus, occurring in southern Texas and northern Mexico.

Coulter (Contr. U. S. Nat. Herb. 3: 368, 369) calls attention to grooved areoles of *Echinocactus brevihamatus* resembling those of *Coryphantha* and *Echinocactus scheeri.*

KEY TO SPECIES.

Radial spines 20 or more, strongly appressed, pectinate; flowering areoles naked..................1. *A. megarhizus*
Radial spines 18 or fewer, more or less spreading, hardly pectinate; flowering areoles woolly.
  Groove half length of tubercle; flower greenish; radial spines 15 to 18 ....2. *A. scheeri*
  Groove extending full length of tubercle; flower rose-colored; radial spines usually 12........3. *A. brevihamatus*

1. Ancistrocactus megarhizus (Rose).

Echinocactus megarhizus Rose, Contr. U. S. Nat. Herb. *12:* 290. 1909.

Solitary or in clusters of 3 or 4; plant body nearly globular or a little elongated, 5 to 8 cm. high, usually solitary, from large and fleshy roots; ribs spiral, divided into dark-green tubercles, 4 to 5 cm. high; radial spines 20 or more, pectinate, at first pale yellow, in age white; in seedlings the spines pubescent; central spines usually 4, the 3 upper similar to the radials, although a little stouter and in young areoles not easily distinguished from them, the lower central spines stout and strongly hooked, 15 mm. long; flowers not seen; fruit green, suggesting that of a *Coryphantha,* clavate, bearing a few naked scales near top; seed black, smooth, shining.

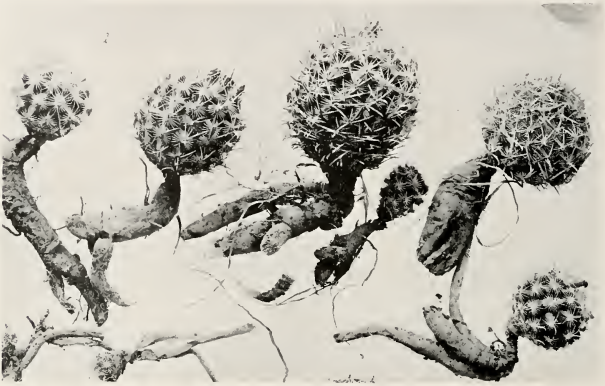

FIG. 1.—Ancistrocactus megarhizus.

Type locality: Near Victoria, Mexico.

Distribution: Known only from the type locality.

Text-figure 1 is from a photograph of the type specimen collected by Dr. Edward Palmer.

2. Ancistrocactus scheeri (Salm-Dyck).

Echinocactus scheeri * Salm-Dyck, Cact. Hort. Dyck. 1849. 155. 1850.

Globular to clavate, 3.5 to 5 cm. long; ribs usually 13, indistinct, somewhat spiraled, strongly divided into stout, terete tubercles grooved only to middle; radial spines 15 to 18, spreading, 12 mm. long or less,

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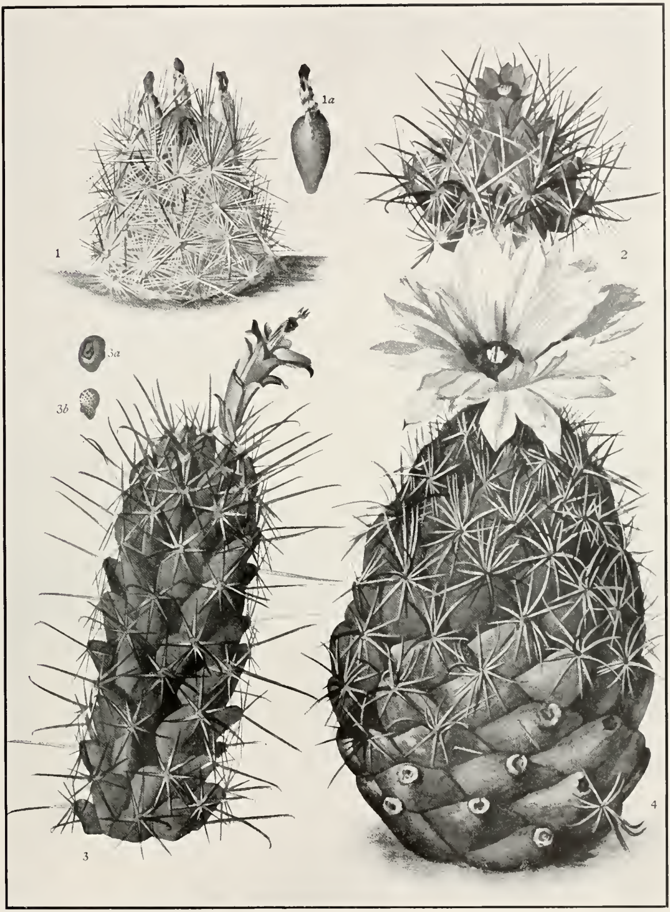
*This name was originally spelled *Echinocactus scheerii.*



1. Fruiting plant of *Coryphantha neo-mexicana.*
1*a*. Fruit of same.
2. Top of flowering plant of *Ancistrocactus scheeri.*
3. Flowering plant of *Cochemiea poselgeri.*
3*a*. Fruit of same.
3*b*. Seed of same.
4. Flowering plant of *Coryphantha cornifera.*
(All three-fourths size.)

white to straw-colored; central spines 3 or 4, the lowest one strongly hooked; flowers small, 2.5 cm. long, greenish yellow; ovary small, nearly naked; seeds large (about 2 mm. long), brown and minutely tuberculate (according to Coulter).

Type locality: Not cited.

Distribution: Southern Texas and northern Mexico.

It is probable that this species is based on Potts's specimen from Chihuahua and, if so, may be a different species from the one described by Engelmann, which he said was "a most elegant little species, one and a half to two inches high; larger spines black and white variegated." We have not seen Potts's plant, but it was referred here by Hemsley.

Illustrations: Cact. Mex. Bound. pl. 17; Rümpler, Sukkulenten f. 105; Cact. Journ. **1**: pl. for March; Schelle, Handb. Kakteenk. 156. f. 84, as *Echinocactus scheeri.*

Plate II, figure 2, shows a plant collected by Dr. Rose at Laredo, Texas, in 1913, which flowered in the New York Botanical Garden in 1914. Text-figure 2 is from a photograph taken by Robert Runyon of a plant collected in 1921 near Brownsville, Texas.

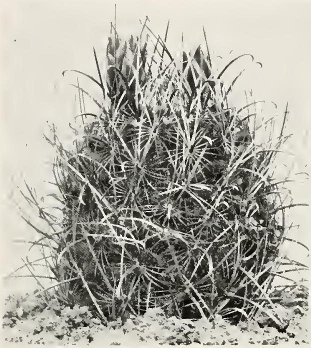


FIG. 2.—Ancistrocactus scheeri.

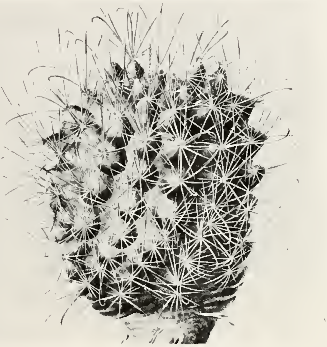


FIG. 3.—Ancistrocactus brevihamatus.

3. Ancistrocactus brevihamatus (Engelmann).

Echinocactus brevihamatus Engelmann, Proc. Amer. Acad. *3:* 271. 1856.
Echinocactus scheeri brevihamatus Weber in Schumann, Gesamtb. Kakteen 336. 1898.

Globular to obovoid, 5 to 10 cm. high, 5 to 7.5 cm. in diameter, dark green; ribs usually 13, compressed, strongly tubercled; tubercles grooved on upper side from spine-cluster to base, the groove woolly; radial spines 10 to 14, terete, white, 10 to 20 mm. long; central spines 4, the lower one porrect, hooked at apex; flowers rose-colored, 25 to 32 mm. long, not so broad as long; inner perianth-segments 15 mm. long, 4 mm. broad; mid-rib darker colored than margins; fruit about 1.5 cm. long, thin-walled, nearly naked; seeds brownish black, about 2 mm. long, smooth or with low flattened papillae, with a deep-set basal hilum.

Type locality: On the San Pedros, Texas.

Distribution: Southern Texas.

Illustrations: Haage and Schmidt, Haupt-Verz. Cact. **1908:** 226; Schelle, Handb. Kakteenk. 157. f. 85, as *Echinocactus scheeri brevihamatus;* Cact. Mex. Bound. pl. 18, 19; Ann. Rep. Smiths. Inst. **1908:** pl. 3, f. 3; Förster, Handb. Cact. ed. 2. 516. f. 64; Rümpler, Sukkulenten 186. f. 104; Blanc, Cacti 41. No. 414; Engler and Prantl, Pflamzenfam. **3**^{6a}: 162. f. 56, c, as *Echinocactus brevihamatus.*

Text-figure 3 is a reproduction of plate 18 of the Cactaceae of the Mexican Boundary Survey.

2. THELOCACTUS (Schumann) Britton and Rose, Bull. Torr. Club 49: 251. 1922.

Cacti of medium size, globular or somewhat depressed, spiny, often densely so; ribs few, low or even indefinite, divided into large, often spiraled, tubercles; flowering tubercles more or less grooved above; flowers from near center of plant, borne on very young tubercles, rather large for the subtribe, campanulate, diurnal; scales on ovary usually few, their axils naked; fruit so far as known dry, dehiscing by a basal pore; seeds black, finely tuberculate, with a large basal hilum.

Type species: *Echinocactus hexaedrophorus* Lemaire.

The generic name is from the Greek, meaning nipple, and cactus, referring to the tubercled ribs. *Thelocactus* was used for a subgenus of *Echinocactus* by Schumann; he described it with "ribs mostly divided into spirally disposed tubercles or mamillae, not protruding like a chin at base; spines straight or slightly curved." He referred to the group a number of diverse species representing several generic types, some of which we took up in Volume III.

We recognize 12 species, all native of Mexico.

To this genus we have referred the *Echinocacti* of previous authors which seem to intergrade with the *Coryphanthanae*. The group is perhaps complex and may contain two or more distinct genera, but most of the species are little known.

KEY TO SPECIES.

- Ribs indefinite, strongly tubercled.
  - Spines all straight.
    - Tubercles not flattened laterally; radial spines 6 to 9 . . . 1. *T. hexaedrophorus*
    - Tubercles flattened laterally; spines 1 to 5.
      - Flowers white . . . 2. *T. rinconensis*
      - Flowers not white.
        - Flowers salmon to yellow . . . 3. *T. lophothele*
        - Flowers rose-purple . . . 4. *T. phymatothele*
  - Some of spines curved outward . . . 5. *T. buekii*
- Ribs definite, but more or less divided into tubercles.
  - Flowers yellowish.
    - Ribs 8 to 13 . . . 6. *T. leucacanthus*
    - Ribs 20 to 25 . . . 7. *T. nidulans*
  - Flowers red to purple.
    - Spines all straight.
      - Spines subulate . . . 8. *T. fossulatus*
      - Spines acicular . . . 9. *T. tulensis*
    - Spines more or less curved.
      - Spines 8 or fewer . . . 10. *T. lloydii*
      - Spines numerous.
        - Central spines flexible, usually straight, porrect or ascending . . . 11. *T. bicolor*
        - Central spines subulate, rigid, some of them curved and reflexed . . . 12. *T. pottsii*

1. Thelocactus hexaedrophorus (Lemaire) Britton and Rose, Bull. Torr. Club. 49: 251. 1922.

Echinocactus hexaedrophorus Lemaire, Cact. Gen. Nov. Sp. 27. 1839.
Echinocactus hexaedrophorus roseus Lemaire in Labouret, Monogr. Cact. 251. 1853.
Echinocactus hexaedrophorus labouretianus Schumann, Gesamtb. Kakteen 438. 1898.
Echinocactus hexaedrophorus major Quehl in Schumann, Gesamtb. Kakteen 438. 1898.

Globose or somewhat flattened above or umbilicate, glaucous, strongly tubercled, not ribbed, 13 to 14 cm. in diameter; tubercles prominent, somewhat 6-sided, 27 mm. broad at base, arranged in indefinite spirals; radial spines 6 to 9, spreading, unequal, 11 to 18 mm. long, rigid, straight, subulate, annulate; central spine much stouter than the radials, erect, 2.3 to 3 cm. long; flowers large, 5.5 cm. long and broader than long when expanded; perianth-segments oblong, purplish; stigma-lobes yellowish white.

Type locality: Tampico, Mexico.

Distribution: Central Mexico.

Schumann refers a plant from San Luis Potosí* to this species. The type, however, is said to have come from Tampico on the coast, while San Luis Potosí is on the table-land at an altitude of 7,000 feet or more, and such an altitudinal distribution is not to be expected. It is possible, but hardly probable, that the plant was actually collected at San Luis Potosí but shipped from Tampico, the port of San Luis Potosí, as such mistakes were common in the early shipments of cacti. Thus, species are attributed to Buenos Aires which came from northwestern Argentina, and *Echinocactus insculptus,* referred to below, although reported from Buenos Aires, is really of Mexican origin.

---

* This plant of the table-land is *Echinocactus fossulatus* Scheidweiler.

Echinocactus insculptus Scheidweiler (Hort. Belge **4:** 120. pl. 7. 1837) is referred here by Schumann, but the illustration indicates a very different plant.

Echinocactus labouretianus, referred by Schumann (Gesamtb. Kakteen 438. 1898) to Cels's Catalogue, probably never described, is to be referred here.

Illustrations: Cact. Journ. **1:** 181; Lemaire, Icon. Cact. pl. 4; Dict. Gard. Nicholson **1:** f. 690; Balt. Cact. Journ. **2:** 196; Rümpler, Sukkulenten 182. f. 101; Knippel, Kakteen pl. 12; Amer. Gard. **11:** 461; Blanc, Cacti 45. No. 508; Schumann, Gesamtb. Kakteen 437. f. 76; Watson, Cact. Cult. 105. f. 36; ed. 3. f. 25, as *Echinocactus hexaedrophorus.*

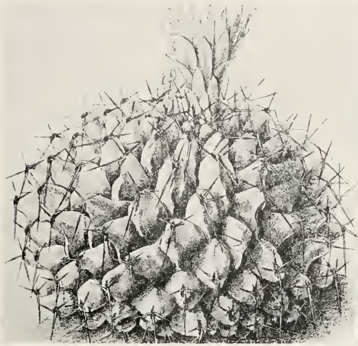


FIG. 4.—Thelocactus rinconensis.

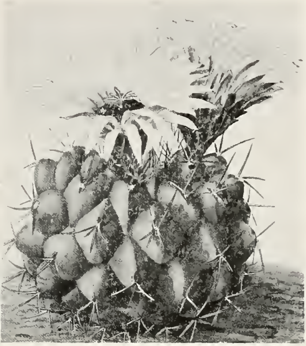


FIG. 5.—Thelocactus phymatothele.

2. Thelocactus rinconensis (Poselger).

Echinocactus rinconensis * Poselger, Allg. Gartenz. *23:* 18. 1855.

Simple, globose or somewhat depressed, 6 to 8 cm. high, 12 cm. in diameter; ribs somewhat spiraled, strongly tubercled; tubercles more or less flattened laterally, somewhat angled; spines usually only 3, acicular, 1.5 cm. long; flowers white, 4 cm. long; inner perianth-segments lanceolate, acute.

Type locality: Near Rinconada, Mexico.

Distribution: Nuevo León, Mexico.

We do not know this species definitely, but we suspect that the plant collected and illustrated by Safford as *Echinocactus lophothele* belongs here.

Illustrations: Schumann, Gesamtb. Kakteen 433. f. 75; Schelle, Handb. Kakteenk. 197. f. 130, as *Echinocactus rinconadensis;* (?) Ann. Rep. Smiths. Inst. **1908:** pl. 3, f. 1, as *Echinocactus lophothele.*

Text-figure 4 is reproduced from the first illustration cited above.

3. Thelocactus lophothele (Salm-Dyck) Britton and Rose, Bull. Torr. Club **49:** 251. 1922.

Echinocactus lophothele Salm-Dyck, Allg. Gartenz. *18:* 395. 1850.

Simple, or in its native state cespitose, globose, sometimes depressed or short-cylindric, up to 25 cm. high, glaucous; ribs indefinite, strongly tuberculate; tubercles flattened; areoles depressed, grayish lanate

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Because this species came from Rinconada, Schumann (Engler and Prantl. Pflanzenfam. 3^{6}a:* 189. 1894) has changed the name to *Echinocactus rinconadensis.*

when young; radial spines 3 to 5, stout, purplish brown, 1 to 3 cm. long; central spines wanting or solitary; flowers salmon to yellow, about 5 cm. broad; perianth-segments nearly linear, acute; scales of ovary glabrous, 6 mm. long.

Type locality: Near Chihuahua.

Distribution: Chihuahua, Mexico.

Our description is drawn mostly from the figure in Blühende Kakteen, plate 126.

We have seen flowering specimens of what is called this species at La Mortola, Italy. Although the type came from Chihauhua, we have seen no plant from that region which answers it.

There is a plant in collections, passing as *Echinocactus lophothele longispinus* (Monatsschr. Kakteenk. 15: 138. 1905), which we do not know.

Illustrations: Schelle, Handb. Kakteenk. 196. f. 129; Blühende Kakteen **3:** pl. 126; Weinberg, Cacti 12; Blanc, Cacti 48. No. 560, as *Echinocactus lophothele.*

4. Thelocactus phymatothele (Poselger).

Echinocactus phymatothelos * Poselger in Förster, Handb. Cact. ed. 2. 602. 1885.

Simple, depressed-globose, 5 cm. high, 9 to 10 cm. in diameter; ribs 13, glaucous-green, divided into low irregular tubercles, these somewhat flattened and pointed; spines usually 1 to 3, sometimes wanting, subulate, rigid, 2 cm. long, brown, spreading; flowers 6 cm. broad; inner perianth-segments rose-purple to pinkish, narrow, acute; scales on ovary and flower-tube acute.

Type locality: Not cited.

Distribution: Mexico.

This plant is evidently related to *Thelocactus lophothele.*

Illustrations: Möllers Deutsche Gärt. Zeit. **25:** 474. f. 6, No. 24; Blühende Kakteen **3:** pl. 130, as *Echinocactus phymatothelos.*

Text-figure 5 is reproduced from the second illustration above cited.

5. Thelocactus buekii (Klein).

Echinocactus buekii † Klein, Gartenflora *8:* 257. 1859.

Stems simple, deep green; tubercles distinct, somewhat pointed, angled; spines about 7, reddish, unequal, some of them outwardly curved, the longer ones much elongated; flowers dark red; inner perianth-segments narrow.

Type locality: Mexico.

Distribution: Known only from the type locality.

Schumann refers this species to *Echinocactus tulensis,* but it is clearly different from his illustration of that species. Its relationship must be rather with *Thelocactus rinconensis* (see Schumann's figure, No. 75).

This plant is probably named for Dr. Johannes Nicolaus Bück, a botanist and physician of Frankfurt, Germany, and author of the Index to De Candolle's Prodromus.

Illustration: Gartenflora **8:** pl. 266, as *Echinocactus buekii.*

Text-figure 6 is reproduced from the illustration cited above.

6. Thelocactus leucacanthus (Zuccarini).

Echinocactus leucacanthus Zuccarini in Pfeiffer, Enum. Cact. 66. 1837.
Cereus tuberosus Pfeiffer, Enum. Cact. 102. 1837.
Cereus maelenii Pfeiffer, Allg. Gartenz. *5:* 378. 1837.
Echinocactus porrectus Lemaire, Cact. Aliq. Nov. 17. 1838.
Echinocactus subporrectus Lemaire, Cact. Aliq. Nov. 25. 1838.
Echinocactus maelenii ‡ Salm-Dyck, Cact. Hort. Dyck. 1842. 18. 1843.
Mammillaria maelenii Salm-Dyck, Cact. Hort. Dyck. 1844. 14. 1845.
Echinocactus leucacanthus tuberosus Förster, Handb. Cact. 287. 1846.
Echinocactus leucacanthus crassior Salm-Dyck, Cact. Hort. Dyck. 1849. 35. 1850.
Echinocactus theloideus Salm-Dyck, Allg. Gartenz. *18:* 396. 1850.

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* This is the original spelling of the name, but it is sometimes written *Echinocactus phymatothele,* the ending being the usual one for specific names of this kind.

† The original spelling of this name was *buckii,* but on the accompanying plate it was *buekii.*

‡ This name is spelled *macleanii* by Hemsley (Biol. Centr. Amer. Bot. *1:* 534. 1880.

Densely cespitose, short-cylindric, 10 to 15 cm. long; ribs 8 to 13, sometimes spiraled, obtuse tubercled; radial spines 7 to 20, at first light yellow, in age gray, spreading or recurved, unequal, the longer ones 4 cm. long, more or less annulate; central spine solitary, at first blackish, but in age gray, up to 5 cm. long; flowers yellow, 5 cm. long; inner perianth-segments numerous, lanceolate, acute; ovary and flower-tube bearing broad imbricated scales.

Type locality: Near Zimapán, Mexico.

Distribution: Zimapán and Ixmiquilpan, Mexico.

We are inclined to refer here *Echinocactus ehrenbergii* Pfeiffer (Allg. Gartenz. 6: 275. 1838), which, according to Schumann, also came from Ixmiquilpan, Mexico. In his monograph Schumann describes the flowers as yellow like those of *E. leucacanthus,* but in his English Keys he says that the flowers are rose-red. Dr. Rose, who collected in this region in 1905, found only one species of this relationship.

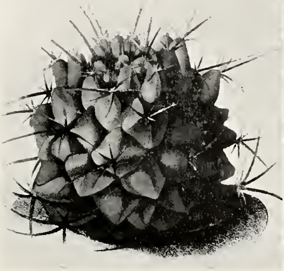

Fig. 6.—Thelocactus buekii.

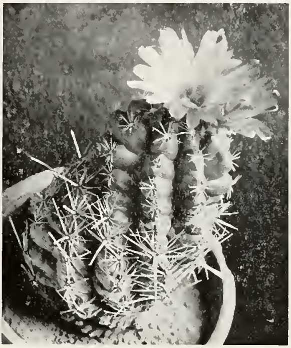

Fig. 7.—Thelocactus leucacanthus.

Echinocactus tuberosus Salm-Dyck (Förster, Handb. Cact. 287. 1846) is known only as a synonym.

Echinocactus tuberosus subporrectus (Förster, Handb. Cact. 523. 1846)belongs here.

Illustrations: Pfeiffer and Otto, Abbild. Beschr. Cact. **1**: pl. 14; Abh. Bayer. Akad. Wiss. München **2**: pl. 2, f. 10; pl. 3, f. 4, as *Echinocactus leucacanthus.*

Figure 7 is from a photograph of the plant collected by Dr. Rose at Ixmiquilpan in 1905.

7. Thelocactus nidulans (Quehl).

Echinocactus nidulans Quehl, Monatsschr. Kakteenk. *21:* 119. 1911.

Simple, depressed-globose, 10 cm. high, sometimes 20 cm. in diameter, gray, usually glaucous; ribs 20 to 25, rather indistinct, divided into tubercles; spines about 15, all similar, 2 to 6 cm. long; flowers 4 cm. long, yellowish white.

Type locality: Mexico.

Distribution: Mexico, but known only from cultivated plants.

Illustrations: Monatsschr. Kakteenk. **22**: 51; Alianza Cientifica Universal **3**: 114, as *Echinocactus nidulans.*

Figure 8 is from a photograph given to Dr. Rose by Frantz de Laet in 1912.

8. Thelocactus fossulatus (Scheidweiler).

Echinocactus fossulatus, Scheidweiler, Allg. Gartenz. 9: 49. 1841.
Echinocactus hexaedrophorus subcostatus Salm-Dyck, Cact. Hort. Dyck. 1849. 34. 1850.
Echinocactus hexaedrophorus fossulatus Salm-Dyck in Labouret, Monogr. Cact. 251. 1853.

Globose to much depressed, 10 to 15 cm. in diameter; ribs usually 13, slightly glaucous, bronzed; tubercles large, somewhat flabby, more or less compressed, dorsally somewhat angled; flowering areoles narrow, sometimes extending forward to next tubercle; radial spines 4 or 5, unequal, 1 to 3.5 cm. long, brown; central spine solitary, 3 to 4.5 cm. long, subulate, annulate; flowers nearly white or slightly tinged with pink; scales on flower-tube ovate, their scarious margins slightly ciliate.

Type locality: Near San Luis Potosí, Mexico.
Distribution: San Luis Potosí, Mexico.

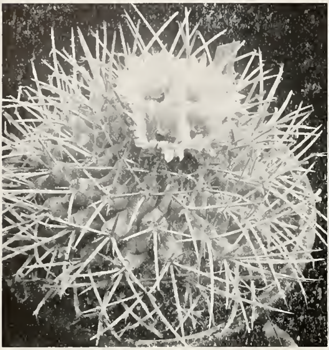

FIG. 8.—Thelocactus nidulans.

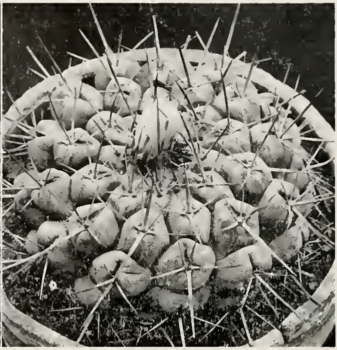

FIG. 9.—Thelocactus fossulatus.

Somewhat similar to the foregoing species is C. A. Purpus's No. 15 from Minas de San Rafael, Mexico. This plant has more rounded tubercles, only 4 spines, these all radial and 2 cm. long or less, somewhat flattened.

Thelocactus fossulatus is certainly distinct from *Thelocactus hexaedrophorus,* differing in the arrangement of the tubercles and in the color of the flowers. The former is from an altitude of 7,000 feet, while the other is from near sea-level.

Echinocactus drageanus (Moerder, Rev. Hort. 67: 186. 1895) and *E. droegeanus* Hildmann (Schumann, Gesamtb. Kakteen 438. 1898) probably belong here, although the latter is referred by Schumann to *Echinocactus hexaedrophorus.* This may be the plant, judging from the name and authorities mentioned, which Schelle (Handb. Kakteenk. 257. 1907) refers to as M*ammillaria rhodantha droegeana* Schumann (*M. droegeana* Hildmann). Schelle questions whether it may not be a distinct species, presumably a *Mammillaria.*

Illustrations: Scientific Amer. **124:** 492, as *Echinocactus;* Curtis's Bot. Mag. **73:** pl. 4311; Ann. Rep. Smiths. Inst. **1908:** pl. 13, f. 3, as *Echinocactus hexaedrophorus;* Pfeiffer, Abbild. Beschr. Cact. **2:** pl. 13, as *Echinocactus fossulatus;* Monatsschr. Kakteenk. **27:** 41, as *Echinocactus hexaedrophorus droegeanus.*

Figure 9 is from a photograph of a plant collected by Dr. Edward Palmer at San Luis Potosí, Mexico, in 1905.

9. Thelocactus tulensis (Poselger).

Echinocactus tulensis Poselger, Allg. Gartenz. *21:* 125. 1853.

Plant simple to abundantly cespitose, globular to short-cylindric, up to 25 cm. high; ribs 8 to 13, strongly tubercled; radial spines 6 to 8, more or less spreading, 10 to 15 mm. long, brownish; central spines solitary or sometimes 2, 3 cm. long; flowers 2.5 cm. long, rose-colored; inner perianth-segments linear-oblong, acute.

Type locality: Near Tula, Tamaulipas, Mexico.

Distribution: Tamaulipas, Mexico.

We have not seen this plant but we have seen two good illustrations. It is closely related to *Thelocactus hexaedrophorus.*

Illustrations: Blühende Kakteen 1: pl. 18; Schumann, Gesamtb. Kakteen 431. f. 74, as *Echinocactus tulensis.*

Figure 10 is reproduced from the first illustration cited above.

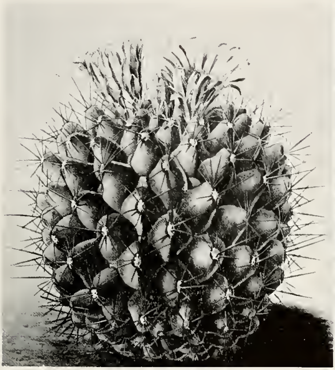

FIG. 10.—Thelocactus tulensis.

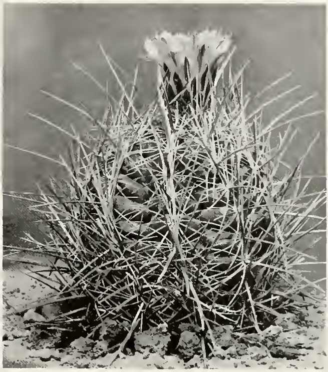

FIG. 11.—Thelocactus bicolor.

10. Thelocactus lloydii sp. nov.

Plants simple, depressed-globose, 8 to 12 cm. broad, pale bluish green, strongly tubercled and strongly armed; tubercles conspicuous but low, often wider than long, sometimes 4 cm. wide; flowering groove rather conspicuous but narrow, extending from spines to about half-way to axil of tubercle; spines usually 8, sometimes with a smaller accessory one, all ascending from base and curved outward from middle, terete or somewhat angled at base, often highly colored below with sharp yellowish-crimson tips, the longer ones 6 cm. long; outer perianth-segments very pale purple, never deep purplish pink; filaments white; anthers deep yellow; style yellowish, pinkish at top; stigma-lobes pinkish yellow.

Collected by F. E. Lloyd in northern Zacatecas, Mexico, May 25, 1908 (No. 33).

11. Thelocactus bicolor (Galeotti) Britton and Rose, Bull. Torr. Club 49: 251. 1922.

Echinocactus bicolor Galeotti in Pfeiffer, Abbild. Beschr. Cact. *2:* pl. 25. 1848.
Echinocactus rhodophthalmus Hooker in Curtis's Bot. Mag. *76:* pl. 4486. 1850.
Echinocactus rhodophthalmus ellipticus Hooker in Curtis's Bot. Mag. *78:* pl. 4634. 1852.
Echinocactus ellipticus Lemaire, Jard. Fleur. *3:* pl. 270. 1853.
Echinocactus bicolor schottii Engelmann, Proc. Amer. Acad. *3:* 277. 1856.
Echinocactus bolansis Rünge, Gartenflora *38:* 106. 1889.
Echinocactus bicolor bolansis Schumann, Gesamtb. Kakteen 303. 1898.
Echinocactus bicolor tricolor Schumann, Gesamtb. Kakteen 303. 1898.
Echinocactus schottii Small, Fl. Southeast. U. S. 814. 1903.

Plants simple, globose to conic, glaucous, small, up to 3 cm. high, very spiny; ribs usually 8, broad, somewhat tubercled; areoles approximate; spines highly colored, sometimes bright red or yellowish or red and yellow; radial spines 9 to 18, widely spreading or sometimes bent backward at tip, 3 cm. long or less; central spines usually 4, ascending or porrect, all straight, 3 to 5 cm. long, subulate; flowers large, 5 to 6 cm. long and fully as broad when expanded; outer perianth-segments pale purple; inner perianth-segments deep purplish pink, oblong, acute; scales on ovary and flower-tube imbricated, ovate, with scarious and ciliate margins; filaments white to purple; stigma-lobes pale to pinkish yellow; fruit small, about 1 cm. long, dehiscing by a large irregular basal opening; seeds 2 mm. long, black, broader at apex, tuberculate with a circular and depressed basal hilum.

Type locality: Mexico.

Distribution: Southern Texas to central Mexico.

Echinocactus tricolor, E. castaniensis, and *E. bicolor montemorelanus* Weber (all in Dict. Hort. Bois 465. 1896) are usually referred here but were never described.

Illustrations: Jard. Fleur **3:** pl. 270, as *Echinocactus ellipticus;* Gartenflora **38:** 106. f. 21, as *Echinocactus bolansis;* Curtis's Bot. Mag. **76:** pl. 4486; Jard. Fleur **1:** pl. 101; Loudon, Encycl. Pl. ed. 3. 1377. f. 19375; Gard. Mag. Bot. **1:** 40, as *E. rhodophthalmus;* Curtis's Bot. Mag. **78:** pl. 4634, as *E. rhodophthalmus ellipticus;* Karsten and Schenck, Vegetationsbilder **2:** pl. 20, c; Pfeiffer, Abbild. Beschr. Cact. **2:** pl. 25; Schumann, Gesamtb. Kakteen Nachtr. 87. f. 14; Ann. Rep. Smiths. Inst. **1908:** pl. 13, f. 2; Blühende Kakteen **2:** pl. 74; Monatsschr. Kakteenk. **12:** 7; **29:** 81; Schelle, Handb. Kakteenk. 157. f. 86; Blanc, Cacti 41. No. 412, as *E. bicolor.*

Figure 11 is from a photograph taken by Robert Runyon at Saltillo, Mexico, in 1921.

12. Thelocactus pottsii (Salm-Dyck).

Echinocactus pottsii * Salm-Dyck, Allg. Gartenz. *18:* 395. 1850.
Echinocactus bicolor pottsii Salm-Dyck. Cact. Hort. Dyck. 1849. 173. 1850.
Echinocactus heterochromus Weber, Dict. Hort. Bois 466. 1896.

Globular or somewhat depressed, 10 to 15 cm. in diameter, somewhat glaucous, yellowish; ribs 8 or 9, broad and obtuse, more or less distinctly tubercled; areoles large, closely set on old plants, densely felted when young, naked in age; spines variable as to number, shape, size, and color; radial spines 7 to 10, acicular, usually terete, straight or incurved, more or less banded with red and white or pale yellow, 1 to 3 cm. long; central spines several, stout-subulate, more or less flattened, 3 or 4 cm. long, often white, but sometimes banded with red; flowers 5 to 6 cm. long; scales on ovary and flower-tube ovate, greenish; margins thin and ciliate; inner perianth-segments light purple, darker at base, oblong; stigma-lobes yellow; fruit globose, small, 1.5 cm. in diameter; seed tuberculate, black, truncate at base, ridged on back; hilum basal, white, circular.

Type locality: Near Chihuahua City.

Distribution: Chihuahua to Coahuila, Mexico.

There are three illustrations passing as *Echinocactus pottsii,* none of which agrees with the original description of Salm-Dyck. Two of these are in Nicholson's Dictionary (Dict. Gard. **4:** 540. f. 23 and Suppl. f. 359) where the species is described as follows: flowers yellow, about 2 inches across, short-tubed, several expanding together at the top of the stem; stem globular, 1½ feet in diameter; ridges about a dozen, rounded and even, with acute sinuses; spines 1 inch long, bristle-like, arranged in clusters of 7 or 9, with a cushion of white wool at the base.

Nicholson indicates that his plant of *E. pottsii* was from California and introduced into cultivation in 1840. There is no Californian species which answers this description or illustration.

The other illustration is Schumann's (Gesamtb. Kakteen 328. f. 57), which is somewhat similar to the above. Schumann states that the radial spines are commonly 6, spreading and yellow; central spines solitary. We are not able to identify this illustration; it suggests some *Echinocereus* as much as it does an *Echinocactus.*

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* Salm-Dyck (Cact. Hort. Dyck. 1849. 35. 1850) credits this name to Scheer.

Illustrations: Knippel, Kakteen pl. 7, in part; Schelle, Handb. Kakteenk. 144. f. 70, as *Echinocactus heterochromus;* Dict. Gard. Nicholson **4:** 540. f. 23; Suppl. 336. f. 359; Schumann, Gesamtb. Kakteen 328. f. 57; Garden **2:** 521; Monatsschr. Kakteenk. **30:** 53; Schelle, Handb. Kakteenk. 155. f. 82; Watson, Cact. Cult. 117. f. 43, as *Echinocactus pottsii.*

PUBLISHED SPECIES, POSSIBLY OF THIS RELATIONSHIP.

ECHINOCACTUS CONOTHELOS Regel and Klein, Ind. Sem. Hort. Petrop. **1860:** 48. 1860.

Ovoid to subcylindric, 10 cm. high, 7.5 cm. in diameter, grayish green; ribs somewhat spiraled, somewhat tubercled at base, the lower tubercles 12 to 20 mm. long; upper areoles oblique, white-tomentose; radial spines 14 to 16, white, spreading to recurved, 8 to 10 mm. long; central spines 2 to 4, erect or a little spreading and recurved, stouter and longer than the radials, 13 to 34 mm. long; flowers and fruit unknown.

Type locality: Near Tanquicillos and Jaumave, Mexico.

This plant was collected by Karwinsky and is known only from his collection. The authors refer the species to Salm-Dyck's section of the *Theloidei,* which, however, is a very diverse group containing representatives of several genera. Schumann was unable to place the species; it may be related to some species of *Thelocactus.*

ECHINOCACTUS HEXAEDRUS Scheidweiler, Bull. Acad. Sci. Brux. **6:** 89. 1839.

Globose to oblong-ovate, glaucous; ribs 18, tuberculate; tubercles 6-angled, gibbous below areoles; areoles oblong, lanate; spines 13, white with purplish bases; lowermost spine longest; central spine 2, either straight or recurved; flowers and fruit unknown.

Type locality: San Luis Potosí.

ECHINOCACTUS SAUSSIERI Weber, Dict. Hort. Bois 468. 1896.

Depressed-globose, 15 to 20 cm. in diameter; ribs spiraled, strongly tubercled; radial spines 9, grayish white, 15 mm. long; central spines 4, acicular, 3 to 4 cm long; flowers purplish, 4 cm. in diameter; inner perianth-segments lanceolate; stamens and style yellow.

Type locality: Matehuala, state of San Luis Potosí, Mexico.

We know this species from the brief description only and are unable to determine its relationship.

ECHINOCACTUS SMITHII Mühlenpfordt in Otto and Dietrich, Allg. Gartenz. **14:** 370. 1846.

Simple, globse to cylindric, 7 cm. in diameter; ribs 21, often spiraled, strongly tubercled, glaucous; radial spines 20 to 27, setaceous, white, 16 mm. long; central spines 4, the upper one flattened, white with brown or black tips; flowers reddish, 3.5 cm. long; fruit globular, 8 mm. in diameter; seed nearly globular, flattened at the hilum.

Type locality: San Luis Potosí.

We know this species from description only and are unable to assign it to any genus.

ECHINOCACTUS VARGASII Regel and Klein, Ind. Sem. Hort. Petrop. **1860:** 48. 1860.

Globose, 5 cm. high, 6 cm. in diameter; tubercles rather large, somewhat angled, arranged in spirals; radial spines 5 or 6, terete, subulate, brownish, 2 to 6 mm. long; central spine 1, erect, 12 mm. long; flowers and fruit unknown.

Type locality: Mexico, near Río Blanco.

Schumann did not know this plant nor do we, but to us it suggests a *Thelocactus.* The authors of the species compared it with *Echinocactus poselgerianus,* now referred to *Coryphantha,* and with *E. phymatothelos.*

3. NEOLLOYDIA Britton and Rose, Bull. Torr. Club. 49: 251. 1922.

Small, more or less cespitose cacti, fibrous-rooted, cylindric, densely spiny, tubercled; tubercles more or less arranged on spiraled ribs, grooved above; radial spines numerous, widely spreading; central spines one to several, much stouter and longer than radials; flowers large, pink or purple, subcentral from axils of nascent tubercles, their segments widely spreading; fruit compressed-globose, dull-colored, thin-walled, becoming papery, dry, with few scales or none; seeds globose, black, dull, tuberculate-roughened, with a large white basal scar; embryo straight in typical species.

Type species: *Mammillaria conoidea* De Candolle.

We recognize 7 species from central and northern Mexico and Texas, which have been transferred from *Echinocactus* and *Mammillaria.* The genus is dedicated to Professor Francis E. Lloyd, whose collections and observations have contributed highly important information to our investigations.

KEY TO SPECIES.

- Plants 3 cm. in diameter or less; central spines sometimes wanting .... 1. *N. pilispina*
- Plants larger; central spines always present.
  - Central spines curved or hooked .... 2. *N. clavata*
  - Central spines all straight.
    - Central spine solitary.
      - Central spine stiff, porrect .... 3. *N. horripila*
      - Central spine weak, ascending or connivent .... 4. *N. beguinii*
    - Central spines several.
      - Spines white or sometimes dark above .... 5. *N. ceratites*
      - Central spines or some of them black.
        - Radial spines 25 or more; Mexican species .... 6. *N. conoidea*
        - Radial spines 15 or less .... 7. *N. texensis*

1. Neolloydia pilispina (J. A. Purpus)

Mammillaria pilispina J. A. Purpus, Monatsschr. Kakteenk. *22:* 150. 1912.

Plants cespitose, about 3 cm. in diameter; ribs indistinct, made up of very definite, somewhat angled tubercles, young spine-areoles clothed with abundant, long, white wool covering top of plant; radial spines 6 or 7, 5 to 6 mm. long, weak and spreading, the upper ones longer and connivent over top of plant, 2 cm. long or more, white with blackish tips; central spines often wanting, sometimes one; flowers small, 1.5 to 2 cm. long, purplish; outer perianth-segments brownish.

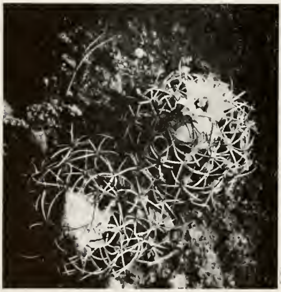
FIG. 12.—Neolloydia pilispina.

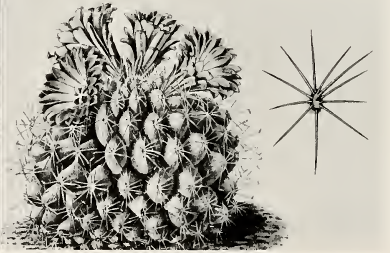
FIG. 13.—Neolloydia horripila.

Type locality: Minas de San Rafael, San Luis Potosí, Mexico.

Distribution: Known only from the type locality.

Figure 12 is from a photograph of a plant collected by C. A. Purpus at the type locality.

2. Neolloydia clavata (Scheidweiler).

Mammillaria clavata Scheidweiler, Bull. Acad. Sci. Brux. *5:* 494. 1838.
Mammillaria stipitata Scheidweiler, Bull. Acad. Sci. Brux. *5:* 495. 1838.
Mammillaria rhaphidacantha Lemaire, Cact. Gen. Nov. Sp. 34. 1839.
Mammillaria ancistracantha Lemaire, Cact. Gen. Nov. Sp. 36. 1839.
Mammillaria rhaphidacantha humilior * Salm-Dyck. in Förster, Handb. Cact. 244. 1846.
Mammillaria scolymoides raphidacantha Salm-Dyck, Cact, Hort. Dyck. 1849. 132. 1850.
Echinocactus corniferus rhaphidacanthus Poselger, Allg. Gartenz. *21:* 102. 1853.
?*Mammillaria potosiana* Jacobi, Allg. Gartenz. *24:* 92. 1856.
Mammillaria sulcoglandulifera Jacobi, Allg. Gartenz. *24:* 92. 1856.
Coryphantha raphidacantha Lemaire, Cactées 34. 1868.
Coryphantha ancistracantha Lemaire, Cactées 34. 1868.
Cactus ancistracanthus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus rhaphidacanthus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus brunneus Coulter, Contr. U. S. Nat. Herb. *3:* 117. 1894.
Cactus maculatus Coulter, Contr. U. S. Nat. Herb.*3:* 117. 1894.
Mammillaria raphidacantha † *ancistracantha* Schumann, Gesamtb. Kakteen 506. 1898.
Mammillaria radicantissima Quehl, Monatsschr. Kakteenk. *22:* 164. 1912.

Plants simple, elongated, cylindric, 10 to 15 cm. high, dark bluish green; tubercles in rows of 5, 8, and 13, conic, grooved above, the axils when young bearing short white wool; glands in the groove 1 to several, large, red; radial spines 6 to 12, with reddish or black tips; central spine 1, somewhat longer than radials, curved or even hooked; flowers small for the genus, about 2 cm. long; outer perianth-segments linear, acute, entire, with broad brownish midrib; inner perianth-segments linear, entire, narrow, creamy white; stamens pinkish, much shorter than the perianth-segments; style pinkish; stigma-lobes 5 or 6, short, greenish.

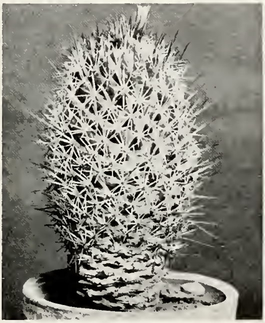

FIG. 14.—Neolloydia clavata.

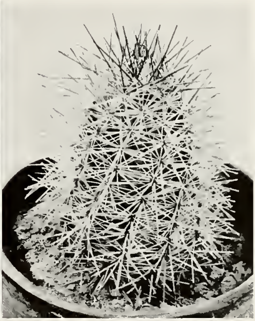

FIG. 15.—Neolloydia conoidea.

Type locality: Not cited.

Distribution: San Luis Potosí, Mexico.

The two species of Coulter, *Cactus brunneus* and *Cactus maculatus,* as well as *Mammillaria radicantissima,* came from San Luis Potosí, and all seem to be so much alike that we do not hesitate to reduce them as above.

Echinocactus raphidacanthus is credited by Schumann to Poselger, but he used the name *raphidacanthus* only as a variety of *E. corniferus.* This binominal was used in 1850 by Salm-Dyck for a very different plant.

Mammillaria humilior Förster we have seen only in Schumann's Index (Gesamtb. Kakteen 824. 1898). He refers it to *M. raphidacantha ancistracantha.*

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* Schumann (Gesamtb. Kakteen 506, 824, Index, 1898), perhaps not intentionally, gives this name specific rank.

† Schumann has dropped the first "h" in *Mammillaria rhaphidacantha* and he is followed by the Monatsschrift für Kakteenkunde.

Illustrations: Blühende Kakteen **1:** pl. 7; Schumann, Gesamtb. Kakteen 505. f. 83, as *Mammillaria rhaphidacantha;* Blühende Kakteen **3:** pl. 163; Monatsschr. Kakteenk. **22:** 165, as *M. radicantissima.*

Figure 14 is from a photograph of a plant collected by Dr. Edward Palmer at San Luis Potosí, Mexico, in 1908 (No. 814).

3. **Neolloydia horripila** (Lemaire).

Mammillaria horripila Lemaire, Cact. Aliq. Nov. 7. 1838.
Echinocactus horripilus Lemaire, Cact. Gen. Nov. Sp. 91. 1839.
Echinocactus horripilus longispinus Monville in Labouret, Monogr. Cact. 265. 1853.

Simple or somewhat cespitose, globular to short-cylindric, 10 to 12 cm. high; tubercles glaucous, prominent, rounded at apex; radial spines 8 to 10, acicular, spreading, 15 mm. long, grayish; central spine solitary, straight, a little longer than the radials; flowers deep purple, 3 cm. long; inner perianth-segments narrowly oblong, acute; stigma-lobes 5, white.

Type locality: Not cited.

Distribution: Hidalgo, Mexico.

Lemaire first referred this plant to *Mammillaria,* but finally described it as an *Echinocactus* on account of its grooved tubercles; he believed that it was an intergrade between these two genera. As he states, its general appearance is that of a species of the so-called *Mammillaria.*

Echinocactus caespititius Pfeiffer is usually given as a synonym of this species, but it seems never to have been described. Schumann cites the place of publication as Salm-Dyck's Cactaceae of 1850 (p. 35), but it is given only as a synonym. It appeared also in Salm-Dyck's Cactaceae of 1845 (p. 17) and in Förster's Handbuch (p. 283), but also as a synonym.

Illustration: Blühende Kakteen **1:** pl. 6, as *Echinocactus horripilus.*

Figure 13 is reproduced from the illustration above cited.

4. **Neolloydia beguinii** (Weber) Britton and Rose, Bull. Torr. Club 49: 252. 1922.

Echinocactus beguinii Weber in Schumann, Gesamtb. Kakteen 442. 1898.

Plant-body cylindric, 10 to 15 cm. high; ribs spiraled and divided at regular intervals into low tubercles resembling geometric figures, pale bluish green in color but nearly hidden by the dense covering of spines; radial spines 20 or more, white, but with dark tips; centrals usually single, longer and ascending; flowers appearing from top of plant, large, 3 to 4 cm. long, bright pink; stigma-lobes 7, long, white; ovary without scales; seeds black, tubercled, with a broad triangular hilum.

Type locality: Probably at Saltillo, in Coahuila, Mexico.

Distribution: Zacatecas and Coahuila, Mexico.

This plant is very distinct from *Echinomastus erectocentrus,* with which it was confused both by Coulter and by Schumann.

Mammillaria beguinii and *Echinocactus beguinii* Weber are referred by Weber (Dict. Hort. Bois 466. 1896) as synonyms of *Echinocactus erectocentrus.* The Index Kewensis (Suppl. 5) refers the former name to Schelle (Handb. Kakteenk. 200. 1907). The name *E. beguinii* has been previously used in Rebut's Catalogue and by Schumann (Monatsschr. Kakteenk. 5: 44. 1905), but not described.

5. **Neolloydia ceratites** (Quehl).

Mammillaria ceratites Quehl, Monatsschr. Kakteenk. *19:* 155. 1909.

Simple or in small clusters, short-cylindric, 6 to 10 cm. high; tubercles somewhat 4-angled, more or less arranged in ribs; young areoles very woolly but becoming naked; radial spines 15 to 20, more or less spreading, white, 1.5 cm. long; central spine 5 or 6, longer and stouter than the radials, blackish above; flowers purple, 3 to 3.5 cm. long; perianth-segments oblong, acute.

Type locality: Mexico.

Distribution: Mexico.

Illustration: Monatsschr. Kakteenk. **19:** 155, as *Mammillaria ceratites.*

Figure 16 is from a photograph of the type plant sent us by Mr. Quehl.

6. Neolloydia conoidea (De Candolle) Britton and Rose, Bull. Torr. Club 49: 252. 1922.

Mammillaria conoidea De Candolle, Mém. Mus. Hist. Nat. Paris *17:* 112. 1828.
Mammillaria grandiflora Otto in Pfeiffer, Enum. Cact. 33. 1837.
Mammillaria diaphanacantha Lemaire, Cact. Aliq. Nov. 39. 1838.
Mammillaria inconspicua Scheidweiler, Bull, Acad. Sci. Brux. *5:* 495. 1838.
Mammillaria echinocactoides Pfeiffer, Allg. Gartenz. *8:* 281. 1840.
Mammillaria scheeri Mühlenpfordt, Allg. Gartenz. *13:* 346. 1845.
Mammillaria strobiliformis Engelmann in Wislizenus, Mem. Tour North. Mex. 113. 1848.
Echinocactus conoideus Poselger, Allg. Gartenz. *21:* 107. 1853.
Cactus conoideus * Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus echinocactoides * Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus grandiflorus Kuntze, Rev. Gen. Pl. *1:* 260. 1891. Not Linnaeus, 1753.

Sometimes simple, but usually cespitose, sometimes forming large clusters, often branching or budding above, short-cylindric; tubercles in 5 or 8 spiral rows, obtuse, their axils very woolly; spines very numerous, often completely covering the plant; radial spines white, 25 or more, widely spreading, 8 to 10 mm. long; central spines several, stouter and longer than the radials, 1 to 3 cm. long, blackish; flowers large; outer perianth-segments dull purple without, lighter toward the margins; inner perianth-segments rich purple; anthers orange; filaments pale yellow, purplish at base; style and stigma-lobes pale yellow, the latter 5 or 6; fruit compressed-globose, dull yellow, mottled with red, becoming dry and papery, then brown; seeds 1 mm. in diameter.

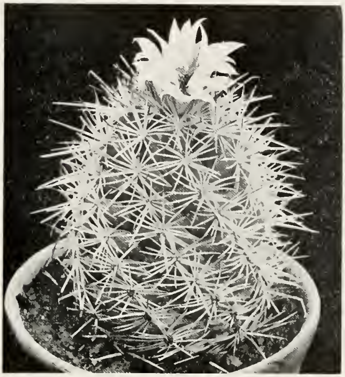

FIG. 16.—Neolloydia ceratites.

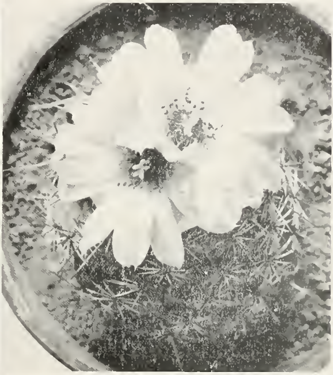

FIG. 17.—Neolloydia conoidea.

Type locality: Mexico.

Distribution: Northern Mexico.

Mammillaria canescens, listed by De Candolle (Prodr. **3:** 460. 1828) as hardly known and given by Pfeiffer (Enum. Cact. 33. 1837) as a synonym of *M. grandiflora,* doubtless belongs here. A plant of this name was in the Berlin Botanical Garden in 1829 (Verh. Ver. Beförd. Gartenb. **6:** 430. 1830).

The name *Coryphantha conoidea* occurs in C. R. Orcutt's Circular to Cactus Fanciers 1922.

Illustrations: De Candolle, Mém. Cact. pl. 2; Pfeiffer, Abbild. Beschr. Cact. **2:** pl. 26; Blühende Kakteen **2:** pl. 96; Schelle, Handb. Kakteenk. 238. f. 155; Ann. Rep. Smiths. Inst.

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* Kuntze's spelling of these two names is as follows: *C. conodeus* and *C. echinocactodes.*

1908: pl. 14, f. 1; Thomas, Zimmerkultur Kakteen 46, as *Mammillaria conoidea;* Monatsschr. Kakteenk. 6: 119, as *Mammillaria grandiflora.*

Figure 15 is from a photograph of a barren plant collected by Dr. Safford in Mexico in 1907 (No. 1334); figure 17 is from a photograph of a flowering plant collected by Dr. Chaffey in the state of Zacatecas, Mexico, July 4, 1910.

Related to the preceding is:

MAMMILLARIA CREBRISPINA De Candolle, Mém. Mus. Hist. Nat. Paris 17: 111. 1828.

Cactus crebrispinus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

This plant was collected by Thomas Coulter but its identification is very uncertain. Pfeiffer thought that it was related to *Mammillaria conoidea* and perhaps it should be referred there.

Mammillaria polychlora Scheidweiler (Förster, Handb. Cact. 205. 1846) was given as a synonym of *M. crebrispina.*

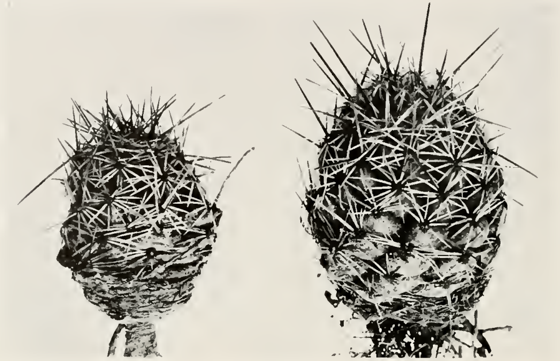


FIG. 18.—Neolloydia texensis.

7. Neolloydia texensis sp. nov.

Globular to short-oblong, 4 to 6 cm. long; tubercles arranged in long spirals, somewhat imbricated, a little flattened dorsally; radial spines 10 to 15, white, widely spreading, about 1 cm. long; central spines 1 to 3, much stouter than the radials, elongated, 2 to 3 cm. long, black; flowers not seen; fruit small, globular, almost hidden by the spines, greenish, thin-walled, dry; seeds black, tuberculate, 1.5 mm. in diameter; hilum large, basal, white lunate.

Collected by MacDougal and Shreve at Sanderson, Texas, December 1920.

This seems to be the plant from Texas referred by Engelmann to *Mammillaria scolymoides* but it probably is not that species which came from central Mexico. *M. scolymoides* probably should be considered a synonym of *Coryphantha cornifera,* the species of which Engelmann once thought that it might be only a form. Coulter (Contr. U. S. Nat. Herb. 3: 115. 1894) treats the Texan plant under the name of *Cactus scolymoides* but the range which he gives is too wide, and doubtless more than one species is involved, both in his description and range. The only specimen which we have seen of this species, except MacDougal and Shreve's plant, is one collected by Walter M. Evans in 1891, which is mixed with *Cactus echinus* and labeled as from near El Paso, Texas.

Figure 18 is from a photograph of plants collected by Dr. MacDougal and Dr. Shreve.

4. MAMILLOPSIS * (Morren) Weber.

Cespitose cacti, often forming large clusters, globular or short-cylindric, completely hidden under a mass of long, soft, white, hair-like spines; tubercles not arranged in ribs, more or less conic, not grooved above, spine-bearing at apex, their axils pubescent and bristly; radial spines numerous, weak, straight; central spines 4 to 6, with yellow, hooked tips; flowers from near top of plant but apparently from axils of old areoles, with a regular, straight, slender, scaly tube and a broad, spreading limb; perianth-segments oblong, obtuse; stamens and style erect, long-exserted beyond tube; scales on flower-tube orbicular, obtuse.

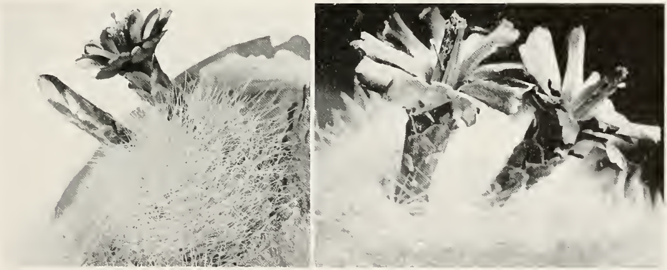
Schumann associated *Mammillaria senilis* Loddiges, the type of the genus, with species now referred to *Cochemiea,* treating them all as a subgenus of *Mammillaria.* but *Cochemiea* has an irregular flower and otherwise is different from this genus.

Morren first proposed the subgeneric name *Mamillopsis,* but Weber, we believe, was justified in recognizing the genus. He states, very properly, that the flowers are very unlike those of any of the species of *Mammillaria.* He also calls attention to the long-exserted stamens, and long and scaly flower-tube, and also to the fact that the filaments are borne in two series, one series being on the flower-tube. The ovary, too, seems to be scaly, and doubtless other differences will be recorded when the species are better known. Two species are here recognized, both from the high mountains of Mexico.

The generic name, *Mamillopsis,* means *Mammillaria*-like.

KEY TO SPECIES

Flowers 6 to 7 cm. long, orange-yellow.......1. *M. senilis*
Flowers 3 cm. long, deep red.......2. *M. diguetii*



FIGS. 19 and 20.—Mamillopsis senilis.

1. Mamillopsis senilis (Loddiges) Weber.

Mammillaria senilis Loddiges in Salm-Dyck, Cact. Hort. Dyck. 1849. 82. 1850.
Cactus senilis Kuntze, Rev. Gen. Pl. *1:* 261. 1891. Not Haworth, 1824.

Stems 6 to 15 cm. high, 3 to 6 cm. in diameter, the flesh juicy and drying red; tubercles 3 to 4 mm. long; spines 30 to 40, 2 cm. long; flowers 6 to 7 cm. long, 6 cm. broad, orange-yellow; perianth-segments oblong, acute, with serrated margin; stigma-lobes 6, spreading; fruit not known.

Type locality: Not cited.

Distribution: High mountains of Chihuahua and Durango.

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* *Mamillopsis* has never been formally published as a genus, but it is mentioned by Weber as a synonym of *Mammillaria senilis* (Dict. Hort. Bois 805. 1898). It was proposed as a subgenus by Morren in 1874 (Belg. Hort. *24:* 33).

This species was probably first collected by Seeman in the Sierra Madre of Mexico, where it was collected by Dr. Rose in 1897. It has frequently been introduced into cultivation but does not do well, soon dying out. It is able to stand considerable cold and in its home is usually covered with snow during the winter.

Salm-Dyck gave two varieties without descriptions, based on two unpublished names, when he first listed *Mammillaria senilis,* as follows: *M. senilis haseloffii* (Salm-Dyck, Cact. Hort. Dyck. 1849. 8. 1850; *M. haseloffii* Ehrenberg, Allg. Gartenz. **17:** 303. 1849) and *M. senilis linkei* (Salm-Dyck, Cact. Hort. Dyck. 1849. 8. 1850; *M. linkei* Ehrenberg). The former, however, was published the previous year as *M. haseloffii* and has priority.

Illustrations: Fl. Serr. **21:** pl. 2159; Rev. Hort. IV. **2:** pl. 334; Belg. Hort. 24: pl. 3; Cact. Journ. **1:** pl. for March; Contr. U. S. Nat. Herb. **5:** pl. 62; Schelle, Handb. Kakteenk. 245. f. 163; Tribune Hort. **4:** pl. 140; De Laet, Cact. Gén. 28. f. 41; Gartenwelt **14:** 331; Möllers Deutsche Gärt. Zeit. **25:** 475. f. 8, No. 31; Succulenta **4:** 80, as *Mammillaria senilis.*

Figure 19 is from a photograph of a flowering plant; figure 20 is from a photograph of two flowers of a plant obtained in the Sierra Madre, Mexico, by I. Ochoterena in 1911; figure 21 is reproduced from the third illustration cited above.

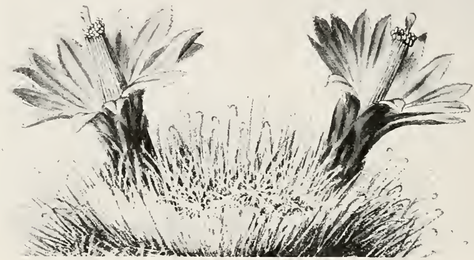

FIG. 21.—Mamillopsis senilis.

2. **Mamillopsis diguetii** (Weber).

Mammillaria senilis diguetii Weber, Bull. Mus. Hist. Nat. Paris *10:* 383. 1904.

Plants densely cespitose, forming a hemispheric clump of about 35 globular heads, each 25 cm. in diameter; radial spines numerous, dark straw-colored; flowers 3 cm. long, about 2 cm. broad, deep red; ovary bearing small scales.

Type locality: Sierra de Nayarit, Jalisco.

Distribution: Jalisco to Sinaloa, Mexico.

This species, until recently, was known only from the single collection of L. Diguet made in March 1900; he found it in the mountains of Jalisco at an altitude of 2,500 meters. It has again been collected by J. G. Ortega in the Sierra de Chabarra, Concordia, Sinaloa, in 1921.

The type is in the Museum of Natural History of Paris and was studied there by Dr. Rose in May 1912; he believes that it is distinct from *M. senilis,* the spines being of a different color and much more rigid than in that species.

5. COCHEMIEA (K. Brandegee) Walton, Cact. Journ. 2: 50. 1899.

Plant-body cylindric, often much elongated, the surface covered with spirally arranged tubercles, these not milky; tubercles not grooved above; spines both central and radial; flowers borne from axils of upper old tubercles, narrowly tubular, curved and bilabiate; perianth-segments in 2 series; stamens and style red, exserted; ovary naked; fruit indehiscent, globular, red, naked, bearing a large scar at top; seeds black, reticulated.

Type species: *Mammillaria halei* Brandegee.

The genus was named for an Indian tribe which once inhabited Lower California. Mrs. Brandegee, who first separated these species as a subgenus, describes the flowers as "scarlet, tubular, slender, somewhat curved, and oblique, with spreading unequal petaloid sepals, so making the flower apparently double as in *Cereus flagelliformis*."

Four species are known, all inhabiting Lower California.

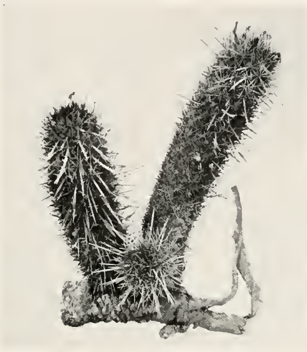

FIG. 22.—Cochemiea halei.

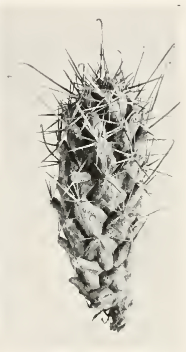

FIG. 23.—Cochemiea poselgeri.

The fact that *Cochemiea* had been raised to generic rank, to which four species had been transferred, has been overlooked by all our botanical indexes. Walton's remarks in this connection are interesting:

> "The plants so classed have flowers very elongated, tubular, with sepals placed as a second ring, removed some distance below the petals; they are oblique like *Epiphyllum truncatum* and *Cereus flagelliformis* and in fact more resemble those flowers than they do those of any *Mammillaria*, so much so that I think it would be best to drop the generic name of *Mammillaria* and simply adopt Mrs. Brandegee's name of *Cochemiea* as a generic name."

Mrs. Brandegee suggested (Erythea 5: 117), "It is possible that some of the elongated species of Mexico proper will be found to belong to this section when the flowers are better known." But we have seen no plants from the mainland of Mexico which suggest this relationship.

KEY TO SPECIES.

Spines all straight . . . . 1. *C. halei*
Some or all of central spines hooked.
  Central spine normally solitary . . . . 2. *C. poselgeri*
  Central spine normally 2 to 11 (sometimes only 1 in *C. setispina*).
    Central spines 1 to 4 . . . . 3. *C. setispina*
    Central spines 8 to 11 . . . . 4. *C. pondii*

1. Cochemiea halei * (Brandegee) Walton, Cact. Journ. **2**: 50. 1899.

Mammillaria halei Brandegee, Proc. Calif. Acad. II. *2:* 161. 1889.
Cactus halei Coulter, Contr. U. S. Nat. Herb. *3:* 106. 1894.

Cespitose; stems nearly upright, often 30 to 50 cm. high, 5 to 7 cm. in diameter, almost entirely covered by the spines; tubercles short; axils of tubercles woolly but not setose; radial spines 10 to 20, 10 to 12 mm. long; central spines 3 or 4, 25 mm. long, all straight; flowers central or nearly so, 4 to 5 cm. long; filaments yellow; stigma-lobes scarlet; fruit scarlet, 12 mm. long; seeds reticulated.

Type locality: Magdalena Island, Lower California.

Distribution: Islands of southern Lower California.

This species was observed first by Mr. T. S. Brandegee in 1889, while making a botanical excursion through Lower California, and described by him the same year. It has been reported from only two islands off the coast of Lower California but it is there very abundant. It has been introduced into Europe and is sometimes offered in the trade. It is remarkable for its very large slender flowers. An abundance of material was collected by Dr. Rose in 1911. The plant does not do well in cultivation.

The species was named for Mr. J. P. Hale, who had extensive domains in Lower California and who assisted Mr. Brandegee while making explorations in 1889.

Illustrations: Proc. Calif. Acad. II. **2**: pl. 6; Monatsschr. Kakteenk. **5**: 89; Schumann, Gesamtb. Kakteen 510. f. 84; Thomas, Zimmerkultur Kakteen 47, as *Mammillaria halei.*

Figure 22 is from a photograph of a barren shoot of a specimen collected by C. R. Orcutt at Magdalena Bay, Lower California, 1917.

2. Cochemiea poselgeri (Hildmann).

Mammillaria poselgeri Hildmann, Garten-Zeitung *4:* 559. 1885.
Mammillaria roseana Brandegee, Zoe *2:* 19. 1891.
Mammillaria radliana Quehl, Monatsschr. Kakteenk. *2:* 104. 1892.
Cactus roseanus Coulter, Contr. U. S. Nat. Herb. *3:* 105. 1894.
Cochemiea rosiana Walton, Cact. Journ. *2:* 50. 1899.

Stems numerous from a central root, spreading or sometimes pendent from rocks or creeping over the ground, often 2 meters long, 4 cm. thick; areoles and upper axils white-woolly, the latter rarely setose; tubercles remote, somewhat flattened; radial spines 7 to 9, 9 to 12 mm. long, straw-colored; central spine 1, hooked, 25 mm. long; flowers appearing in the upper axils, 3 cm. long, scarlet; stamens and style exserted; fruit globular, 6 to 8 mm. in diameter.

Type locality: Cape Region, Lower California.

Distribution: At lower elevations in southern Lower California.

This cactus, according to Mr. Brandegee, is one of the most showy of this region.

Mammillaria longihamata Engelmann was a manuscript name taken up by Coulter (Contr. U. S. Nat. Herb. **3**: 105. 1894) as a synonym of *Cactus roseanus.*

Illustrations: Thomas, Zimmerkultur Kakteen 49; Monatsschr. Kakteenk. 2: 105, as *Mammillaria radliana;* Garten-Zeitung **4**: 559. f. 131; Schelle, Handb. Kakteenk. 246. f. 164, as *M. poselgeri.*

Plate II, figure 3, shows a plant collected by Dr. Rose at Cape San Lucas, Lower California, which flowered in the New York Botanical Garden in 1915; figure *3a* shows the fruit and figure *3b* the seed from a plant collected by Dr. Wm. S. W. Kew near La Junta, Lower California, November 10, 1920. Figure 23 is from a photograph of a plant collected by C. R. Orcutt near Magdalena, Lower California, and sent to the Bureau of Chemistry, U. S. Department of Agriculture, in 1917.

3. Cochemiea setispina (Coulter) Walton, Cact. Journ. **2**: 51. 1899.

Cactus setispinus Coulter, Contr. U. S. Nat. Herb. *3:* 106. 1894.
Mammillaria setispina Engelmann in K. Brandegee, Erythea *5:* 117. 1897.

Stems ascending, 30 cm. high; tubercles short; axils of tubercles woolly but not setose; radial spines 10 to 12, white with black tips, widely spreading, unequal, 10 to 34 cm. long, slender; central spines 1 to 4, stouter than the radials, one of them strongly hooked; flowers not definitely known but probably large; fruit obovoid, 3 cm. long, scarlet; seeds black and pitted.

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* Walton published this name as *Cochemiea hallei.*

Type locality: San Borgia, Lower California.

Distribution: Interior of southern Lower California.

We have not seen living specimens of the species. Dr. Rose obtained a small specimen from L. Quehl at Halle in 1912.

The type of this species, now in the herbarium of the Missouri Botanical Garden, was collected by William Gabb in 1867, while Brandegee obtained specimens in 1889. Dr. C. A. Purpus found it near Calmalli and wrote of it as follows (Cact. Journ. **2:** 54. 1899):

> "My next trip was to a chain of granite mountains about 20 miles from Calmalli.
>
> "I was very much surprised to find on the slope of the mountains *Mamillaria setispina* Engelmann, which until now I had not been able to collect as a living specimen. I came upon it afterwards also in gneiss, trachyt, porphur, and in a sandstone conglomerate. Ground composed of granite gravel appears to suit it best."

4. **Cochemiea pondii** (Greene) Walton, Cact. Journ. **2:** 51. 1899.

Mammillaria pondii Greene, Pittonia *1:* 268. 1889.
Cactus pondii Coulter, Contr. U. S. Nat. Herb. *3:* 102. 1894.

Stems at first upright, cylindric, simple or few-branched, 7 cm. to 3 dm. high, hidden under a dense covering of spines; axils of tubercles setose; young areoles white-tomentose; radial spines white, whitish or sometimes brownish, 15 to 25, spreading; central spines 8 to 11, much longer and stouter than the radials, the longest 3 cm. long, 1 or 2 hooked; flowers slender, 5 cm. long, bright scarlet; stamens exserted; fruit purplish red, 18 mm. long, ovoid to obovoid.

Type locality: Cedros Island.

Distribution: Islands off the western coast of northern Lower California.

This plant was found in great abundance on Cedros Island by Dr. Rose in 1911 (No. 16090) and a number of living specimens were brought to Washington and New York. These have been in cultivation for more than ten years but have never flowered. It is not often met with in cultivation.

This species was named for Charles Fremont Pond, U. S. N., who collected plants on Cedros and other islands off the coast of Lower California in 1889.

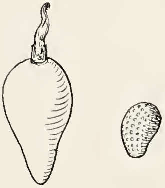
FIGS. 24 and 24*a*.—Fruit and seed of Cochemiea pondii.

Figure 24 shows the fruit and figure 24*a* the seed from specimens obtained at the type locality by Dr. Rose in 1911.

6. CORYPHANTHA (Engelmann) Lemaire, Cactées 32. 1868.

Plant body globular to cylindric, either solitary or cespitose; tubercles, except the very earliest ones, grooved on upper surface* from apex to base; flowers from near top of plant and from base of young and growing tubercles, large and showy, generally yellow, sometimes purple or red; ovary naked or, occasionally, bearing a few scales in some species; perianth long-persistent †; fruit large,‡ ripening slowly, ovoid to oblong, greenish or yellowish; seeds brown (black and angled in *Coryphantha cubensis*), lightly reticulated or nearly smooth, thin-shelled, with a central or subventral hilum; embryo curved, at least in some species.

Type species:§ *Mammillaria sulcolanata* Lemaire.

The generic name is from the Greek, meaning top, and from the Greek, meaning flower, referring to the insertion of the flowers at the top of the plant. We recognize 37 species in the genus. The genus *Coryphantha* was proposed by Lemaire in 1868, but he did not designate a type. The name, however, comes from Engelmann, who first used it as a subgenus as *Mammillaria* (Proc. Amer. Acad. 3: 264. 1856).

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* In *C. macromeris* the tubercle is grooved only for about half its length.

† We quote the following observation of Engelmann in this connection: "I have repeatedly observed, and in a considerable number of species, that the red berries of the *Mammillariae* are always destitute of the remnants of the perigone, but the green fruits always are topped with it (Mem. Tour North. Mex. 21)."

‡ The only fruit which we have seen of *C. nickelsae* was globose and small, 5 to 7 mm. in diameter, but the species otherwise is of this alliance.

§ See Britton and Millspaugh, Bahama Flora 295. 1920.

The position of this group has always been puzzling to cactus students. Dr. Poselger believed that it was a section of *Echinocactus* and transferred certain of these species which had been described under *Mammillaria* to *Echinocactus*. In its vertical, nearly central flowers it does approach the *Echinocactanae*, but otherwise it is quite distinct.

In the origin of their large flowers, in the shape and structure of their fruit, and in the color and form of their seeds the species compose a rather natural group, but they are diverse in form and armament. The species are most common in central Mexico, a few extending into the southern United States, and one extending into southern Canada.

The groove on the upper side of the tubercle which is so characteristic of the genus does not occur on seedlings or on very young plants, but it is always found on old flowering plants and seems to be associated with the inflorescence, for the flowers appear only in the axils of grooved tubercles and originate at the bottom of this groove. Plants which grow in conservatories for a long time without flowering lose this groove;* we have had one plant of this kind under observation for fifteen years.

KEY TO SPECIES

- A. Seeds brown, not angled; flowers usually large.
  - B. Tubercles grooved to middle or a little below; ovary bearing scales with woolly axils. Series *Macromeres*.
    - Tubercles elongated, bright green ... 1. *C. macromeris*
    - Tubercles short, grayish green ... 2. *C. runyonii*
  - BB. Tubercles grooved from tip to base except in young plants; ovary naked.
    - C. Grooves of tubercles bearing large yellow or red glands. Series *Recurvatae*.
      - Flowers white ... 3. *C. ottonis*
      - Flowers not white.
        - Stems globular.
          - Radial spines more or less recurved ... 4. *C. recurvata*
          - Radial spines spreading or ascending.
            - Spines dark, sometimes black ... 5. *C. poselgeriana*
            - Spines yellow or sometimes tinged with red.
              - Central spines slender and flexible ... 6. *C. muehlenpfordtii*
              - Central spines stout and rigid.
                - Radial spines subulate ... 7. *C. guerkeana*
                - Radial spines acicular ... 8. *C. echinoidea*
        - Stems cylindric.
          - Stems bluish green ... 9. *C. clava*
          - Stems yellowish green.
            - Central spine usually one.
              - Glands in groove red ... 10. *C. octacantha*
              - Glands in groove yellow ... 11. *C. exsudans*
            - Central spines 2 ... 12. *C. erecta*
    - CC. Grooves of tubercles without large glands. Series *Sulcolanatae*.
      - D. Outer perianth-segments not ciliate.
        - E. Flowers purplish or rose ... 13. *C. elephantidens*
        - EE. Flowers yellow or white.
          - F. Tubercles very large, broader than high ... 14. *C. bumamma*
          - FF. Tubercles of medium size, if large, longer than broad.
            - G. Plants large for this genus (often 8 cm. in diameter; seeds 3 mm. in diameter ... 15. *C. robustispina*
            - GG. Plants much smaller than in *C. robustispina;* seeds 2 mm. in diameter or less.
              - H. Central spines usually wanting.
                - Secondary cluster of spines developed in upper part of areoles and connivent at top ... 16. *C. connivens*
                - Secondary cluster of spines not developed.
                  - Spines pectinate ... 17. *C. pectinata*
                  - Spines not pectinate.
                    - Spines 14 or more.
                      - Spines slender with long black tips ... 18. *C. nickelsae*
                      - Spines rather short with light tips.
                        - Spines subulate ... 19. *C. compacta*
                        - Spines acicular ... 20. *C. radians*
                    - Spines fewer than 15.
                      - Spines slender and weak ... 21. *C. sulcolanata*
                      - Spines not slender ... 22. *C. retusa*

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* *Mammillaria potosiana* and *M. polymorpha* seem to have been based on such plants.

HH. Central spines one to several.
  I. Central spines strongly hooked. . . . . .23. *C. palmeri*
  II. Central spines straight or at most curved.
    J. Central spines more or less curved.
      Central spine one, sometimes more in No. 25.
        Radial spines nearly as long as central. . . . . . . .24. *C. cornifera*
        Radial spines about half as long as central. . . . .25. *C. salm-dyckiana*
      Central spines several.
        Radial spines 20 or more. . . . . .26. *C. pallida*
        Radial spines 12 or fewer. . . . . .27. *C. pycnacantha*
    JJ. Central spines straight.
      Radial spines, two kinds (to be looked for here) . . 5. *C. poselgeriana*
      Radial spines of one kind.
        Plant almost hidden under mass of spines; fruit oblong . . . . .28. *C. echinus*
        Plant not hidden under mass of spines; fruit globular . . . . .29. *C. durangensis*
DD. Outer perianth-segments ciliate.
  Flowers yellow . . . . .30. *C. chlorantha*
  Flowers purplish to pink.
    Inner perianth-segments linear or lanceolate.
      Stigma-lobes purple, apiculate. . . . . .31. *C. vivipara*
      Stigma-lobes white, obtuse or notched.
        Flowers 4 to 7 cm. broad, rose to purple.
          Plants mostly solitary; inner perianth-segments broadly linear. . .32. *C. neo-mexicana*
          Plants mostly cespitose; inner segments linear-lanceolate. . . . . . . .33. *C. arizonica*
        Flowers very short, 3 cm. broad, light pink. .34. *C. deserti*
    Inner perianth-segments oblanceolate. . . . . .35. *C. aggregata*
AAA. Seeds black, angled; flowers minute. Series *Cubenses*. . . . . .36. *C. cubensis*
AA. Ungrouped species . . . . .37. *C. sulcata*

1. Coryphantha macromeris (Engelmann) Lemaire, Cactées 35. 1868.

Mammillaria macromeris Engelmann in Wislizenus, Mem.Tour North. Mex. 97. 1848.
Mammillaria heteromorpha Scheer in Salm-Dyck. Cact. Hort. Dyck. 1849. 128. 1850.
Echinocactus macromeris Poselger, Allg. Gartenz. *21:* 102. 1853.
Echinocactus heteromorphus Poselger, Allg. Gartenz. *21:* 126. 1853.
Mammillaria dactylithele Labouret, Monogr. Cact. 146. 1853.
Cactus macromeris Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus hetermorphus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

Plant branching at base, often many-headed, up to 2 dm. long; tubercles large, soft, loosely arranged, elongated, 12 to 30 cm. long, grooved on upper side about two-thirds of their length; spines 10 to 17, slender, the radials white; central spines several, black, the longer ones 5 cm. long; flowers large, purple, 6 to 8 cm. broad; scales on flower-tube ciliate; ovary bearing a few scales with hairy axils; fruit 15 to 25 mm. long; seeds globose, brown but sometimes described as yellow, smooth.

Type locality: Near Doñana, New Mexico.

Distribution: Southern New Mexico, western Texas, and Chihuahua, south to Zacatecas, Mexico.

This species and the following one are not closely related to the others of this genus. The tubercles are much more elongated and flattened, and the groove on the upper surface never extends to the base. Sometimes a branch or bulblet is produced insted of a flower.

Here may belong *Coryphantha heteromorpha* Lemaire (Cactées 34. 1868); this name is apparently erroneously referred to in the Index Kewensis (1: 624) as *Coryphantha heterophylla* (see *Ariocarpus fissuratus,* Cactaceae 3: 83).

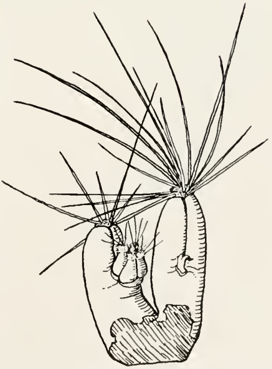
Fig. 25.—Tubercles of Coryphantha macromeris.

Mammillaria brownii Toumey was erroneously referred here by Schumann.

Mammillaria macromeris var. *longispina* and var. *nigrispina* are mentioned by Schelle (Handb. Kakteenk. 237. 1907).

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Illustrations: Cact. Journ. **1:** 43; Förster, Handb. Cact. ed. 2. 399. f. 41; Rümpler, Sukkulenten 205. f. 116; Dict. Gard. Nicholson **4:** 564. f. 36; Suppl. 517. f. 552; Goebel, Pflanz. Schild. **1:** pl. 1, f. 6; Amer. Gard. **11:** 460; West Amer. Sci. **13:** 39; Cact. Mex. Bound. pl. 14, 15; Cycl. Amer. Hort. Bailey **2:** f. 746*a,* 1355; Stand. Cycl. Hort. Bailey **4:** f. 2314; Gartenflora **42:** 543. f. 111; Schelle, Handb. Kakteenk. 237. f. 152; Balt. Cact. Journ. **1:** 21; Watson, Cact. Cult. 165. f. 64; ed. 3. f. 41, as *Mammillaria macromeris.*

Figure 25 is from a drawing of two tubercles, showing the grooves on the upper side, of a plant sent by Mrs. S. L. Pattison from western Texas. At the base of one is shown the flower-scar; in the other is a small bud.

2. Coryphantha runyonii sp. nov.

Forming low clumps, sometimes 5 dm. in diameter, grayish green, with a thick, elongated tap-root; tubercles rather short, 1 to 2 cm. long, terete or somewhat flattened, grooved on the upper half, rarely more, but never to the base; radial spines 6 or more, spreading, acicular, very variable in length, 3 cm. long or less, sometimes all yellow or sometimes one or more in a cluster brown, otherwise yellow; central spines on young plant solitary, dark brown to black but in old plants sometimes 2 or 3, somewhat angled, up to 6 cm. long; flowers large, purple, 5 cm. broad; outer perianth-segments ciliate; inner perianth-segments spatulate, oblong, acute; fruit green; seeds brown.

Found along the Rio Grande from Brownsville to Rio Grande City. This species has been repeatedly observed by Robert Runyon, from whom we received living plants in 1921 (No. 15, type) and 1922.

Mr. Runyon wrote us about the plant as follows:

"I also inclose you herewith two photographs of the plant you have called *Coryphantha runyonii.* I first became interested in this plant about two years ago when I saw it growing near Rio Grande, Texas. It was found at one place only, but in abundance. It grows on the gravel hillside and down in the lower land in a kind of white silt soil.

"The fruit is green and the flowers are a very pretty pink to a purple with a delicate fringed petal. The tubercles are very irregular. The largest plants are about 18 inches in diameter and would weigh not less than fifty pounds."

Plate I, figure 1, is from a photograph sent us by Robert Runyon.

3. Coryphantha ottonis (Pfeiffer) Lemaire, Cactées 34. 1868.

Mammillaria ottonis Pfeiffer, Allg. Gartenz. *6:* 274. 1838.
Echinocactus ottonianus Poselger, Allg. Gartenz. *21:* 102. 1853.
Cactus ottonis Kuntze, Rev. Gen. Pl. *1:* 261. 1891. Not Lehmann, 1827.
Mammillaria bussleri Mundt in Schumann, Monatsschr. Kakteenk. *12:* 47. 1902.
Mammillaria golziana Haage jr., Monatsschr. Kakteenk. *19:* 100. 1909.

Simple, globular to short-cylindric, 12 cm. high or less, 8 cm. in diameter, glaucous to grayish green; radial spines 8 to 12, nearly equal, 8 to 10 mm. long; central spines 3 or 4, longer and a little stouter than the radials; axils of flowering tubercles woolly; flowers white, 4 cm. long; outer perianth-segments oblong, obtuse; inner perianth-segments apiculate; stigma-lobes 10, green.

Type locality: Mineral del Monte, Mexico.

Distribution: Central Mexico.

The name here used was proposed by Lemaire (Cactées 34) in 1868 but not formally published. *Mammillaria ottonis tenuispina* Pfeiffer is sometimes used but we have seen no formal description.

Nicholson (see also Watson, Cact. Cult. 168. f. 66; and ed. 3. f. 40) describes and illustrates (Dict. Gard. Nicholson Suppl. 517. f. 553) under this name a very peculiar specimen in which the flowers are borne away from the top of the plant; it is doubtless not congeneric with this species. Nicholson's description is here quoted:

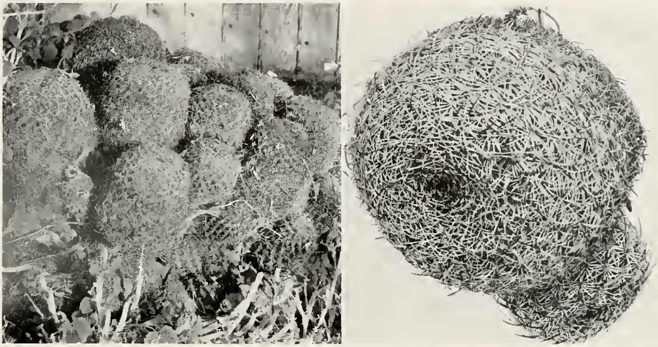
"Flowers white, large for the size of the plant. May and June. Stem small, compressed, 3 in. across, with numerous compressed tubercles, and short hair-like spines (Mexico. 1834. See fig. 553). There is another species called *M. ottonis,* having a large spiny stem."

Here we believe belong some of the plants which are passing as *Mammillaria golziana.* Very different, however, are the two published illustrations of Kuntze (Cact. 1910 and Monatsschr. Kakteenk. **19:** 101. 1909), which also seem to differ from each other.

Illustrations: Monatsschr. Kakteenk. **12:** 47, as *Mammillaria bussleri;* Monatsschr. Kakteenk. **27:** 3. f. a, as *Mammillaria golziana;* Monatsschr. Kakteenk. **27:** 3. f. b, as *Mammillaria ottonis.*

4. Coryphantha recurvata (Engelmann).

Mammillaria recurvispina Engelmann, Proc. Amer. Acad. *3:* 266. 1856. Not De Vriese, 1839.
Mammillaria recurvata Engelmann, Trans. St. Louis Acad. *2:* 202. 1863.
Cactus recurvatus Kuntze, Rev. Gen. Pl. *1:* 259. 1891.
Cactus engelmannii [*] Kuntze, Rev. Gen. Pl. *1:* 260. 1891.



Figs. 26 and 27.—Coryphantha recurvata.

Plant-body depressed-globose, 10 to 20 cm. in diameter, often forming large masses 30 to 90 cm. in diameter and sometimes with over 50 heads; tubercles low; radial spines about 20, yellow to gray, with dark tips, pectinate, recurved; central spines 1, rarely 2, longer and darker than the radials, 12 to 20 mm. long, more or less reflexed, often appressed; flowers 25 to 35 mm. long, said to be brownish outside; inner perianth-segments lemon-yellow; fruit not known.

Type locality: Sonora. Explained in the Cactaceae of the Mexican Boundary to be eastern parts of Pimeria Alta in Sonora, especially in the Sierra del Pajarito.

Distribution: Arizona and Mexico, especially along the United States-Mexican Boundary near Nogales.

Engelmann describes [†] a peculiar flowering habit for *Coryphantha* when he says that the flowers originate in the base of the grooves of full-grown tubercles, being scattered over the top of the plant. We have also noticed this character; not only are the flowers borne in the axils of mature tubercles, but they are produced in great abundance in a circle 5 to 6 cm. in diameter.

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[*] It is possible that Lemaire also gave the name *Coryphantha engelmannii* for *Mammillaria recurvispina,* though this is not shown by the text.

[†] See Cact. Mex. Bound. 12. 1859.

Otto Kuntze made the binomial *Cactus engelmannii* because, as he states, the name *Mammillaria recurvispina* De Vriese had priority over Engelmann's name. Engelmann, however, had long before renamed his plant.

Mammillaria nogalensis Rünge (Schumann, Gesamtb. Kakteen 494. 1898) has been referred here as a synonym, but this name had already been used by Walton.

Illustrations: Schelle, Handb. Kakteenk. 239. f. 156, as *Mammillaria recurvata;* Cact. Journ. **1:** pl. for March; **2:** 148; pl. for September, as *M. nogalensis.*

Figure 26 is from a photograph by Dr. MacDougal at Calabasas, showing a clump; figure 27 is from a photograph of a plant sent by F. J. Dyer from Nogales.

5. Coryphantha poselgeriana (Dietrich).

Echinocactus poselgerianus Dietrich, Allg. Gartenz. *19:* 346. 1851.*
Echinocactus saltillensis Poselger, Allg. Gartenz. *21:* 101. 1853.
Echinocactus salinensis Poselger, Allg. Gartenz. *21:* 106. 1853.
Mammillaria difficilis Quehl, Monatsschr. Kakteenk. *18:* 107. 1908.
Mammillaria valida J. A. Purpus, Monatsschr. Kakteenk. *21:* 97. 1911. Not Weber, 1898.

Plant-body large for the genus, globular, bluish green; tubercles large, closely packed together and at base strongly angled; radial spines of two kinds, the 4 or 5 lower ones spreading, subulate, reddish to black, about as long as the single central one (2 to 4 cm. long); the upper radials, 5 to 8, ascending together, yellowish with black tips, weak, acicular; flower large, 4 to 5 cm. long and nearly as broad when expanded, flesh-colored, the segments spatulate, usually rounded at apex; fruit oblong, 15 mm. long; seeds brownish.

Type species: Near Saltillo, Mexico.

Distribution: States of Nuevo Leon, Coahuila, and Zacatecas, Mexico.

Two different plants have been passing under the name *Echinocactus saltillensis.* The one now in the trade, called *E. ingens* var. *saltillensis* by Schumann, is a very large plant and is a true *Echinocactus* which we have already elsewhere described as *E. palmeri;*† the other, which is the one originally described by Poselger, is a small globular *Coryphantha* and has usually been taken for *Mammillaria scheeri,* more recently described as *M. valida.*

The clusters of connivent weak spines, so characteristic of this species, are not always shown in young plants and this may account for certain seeming discrepancies in the original descriptions. The nascent spines are sometimes red, bleaching white; the gland in the groove of the tubercle is bright red.

Illustrations: De Laet, Cat. Gén. f. 44; Schelle, Handb. Kakteenk. 239. f. 157; Tribune Hort. **4:** pl. 139; Rev. Hort. Belg. **40:** after 196, as *Mammillaria radians;* Monatsschr. Kakteenk. **21:** 99, as *Mammillaria valida;* (?) Blanc, Cacti 50. No. 599; (?) Cact. Journ. **2:** 55, as *Echinocactus poselgerianus;* Monatsschr. Kakteenk. **18:** 107, as *Mammillaria difficilis;* Rother, Praktischer Leitfaden Kakteen 31, as *Echinocactus scheeri.*

6. Coryphantha muehlenpfordtii (Poselger).

Mammillaria scheeri Mühlenpfordt, Allg. Gartenz. *15:* 97. 1847. Not Mühlenpfordt, 1845.
Echinocactus muehlenpfordtii Poselger, Allg. Gartenz. *21:* 102. 1853.
Mammillaria scheeri valida Engelmann, Proc. Amer. Acad. *3:* 265. 1856.
Coryphantha scheeri Lemaire, Cactées 35. 1868.
Cactus scheeri Kuntze, Rev. Gen. Pl. *1:* 261. 1891.†

Plants nearly globular, usually simple, short-oblong, 20 cm. long, 7.5 to 15 cm. in diameter; tubercles large, 1 to 2.5 cm. long; axils of young tubercles grooved and young spine-areoles very woolly; grooves bearing large dark-colored glands; spines variable, reddish to yellow with brown to black tips; radials 6 to 16, usually about 2 cm. long, straight; central spines 1 to 4, subulate, stouter than the radials, 3 to 3.5 cm. long, from nearly straight to curved at tip or even strongly hooked; flowers yellow, 6 cm. long; scales on flower-tube and outer perianth-segments more or less lacerated; inner perianth-segments oblong, entire, acute; fruit greenish, oblong, 3 to 3.5 cm. long, naked; seeds large, 3 mm. long, brown, shining, smooth.

Type locality: Mexico.

Distribution: Northern Chihuahua, western Texas, and southern New Mexico.

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* We have not seen the type of this species but Bödeker has sent us a copy of the photograph of it left by Poselger.

† See Contr. U. S. Nat. Herb. *12:* 290. 1909; Britton and Rose, Cactaceae *3:* 172. 1922.

There has been considerable confusion regarding this species, which was first described as *Mammillaria scheeri* by Mühlenpfordt in 1847, but this proved to be a homonym. This led Poselger in 1853, when he transferred the species to *Echinocactus*, to published it as *E. muehlenpfordtii*.

Dr. Engelmann in 1856 described a variety of *Mammillaria scheeri*, calling it *valida*. Some time afterwards he compared this variety with the type of the species and decided that they were the same. We have examined several specimens from near the type locality of the variety *valida*, which is near El Paso, Texas.

It is possible that Scheer's plant was a very young one, which might account for the differences in form and spines. The *Mammillaria scheeri* of Schumann's Monograph is a complex of 4 or 5 distinct species.

Illustrations: Allg. Gartenz. **15:** 97. pl. 2; Förster, Handb. Cact. ed. 2. 406. f. 44; Schumann, Gesamtb. Kakteen 485. f. 80; Monatsschr. Kakteenk. **8:** 23; **10:** 127; Schelle, Handb. Kakteenk. 237. f. 153, as *Mammillaria scheeri*.

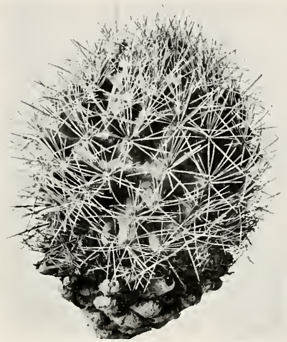

FIG. 28.—Corphantha muehlenpfordtii.

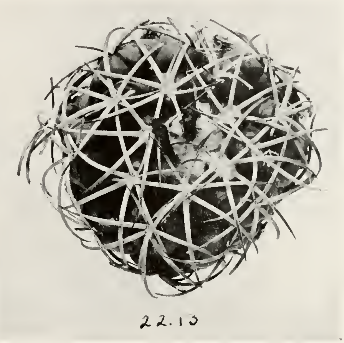

FIG. 29.—Coryphantha bumamma.

Figure 28 is from a photograph of a plant collected in western Texas by Mrs. S. L. Pattison in 1920.

7. Coryphantha guerkeana (Bödeker).

Mammillaria guerkeana Bödeker, Monatsschr. Kakteenk. *24:* 52. 1914.

Plant-body globular, 6 to 7 cm. in diameter; tubercles bluish green, somewhat broader than thick, bearing a large red gland at base of groove and sometimes at top; radial spines 9 to 12, yellow when young, spreading, bulbose at base, rather stout; central spines 3 or 4, rarely one of them stouter, often bent slightly at tip; flowering areoles very woolly; ovary oblong, naked; flower and fruit not seen.

Type locality: Mexico.

Distribution: Durango, Mexico.

This species is near *Coryphantha poselgeriana*, but is smaller and has different spines.

We have seen photographs of the type and have spine-clusters, all obtained from L. Quehl of Halle. We would also refer here specimens obtained by Dr. E. Palmer near Durango City in 1906 (No. 456).

Illustrations: Monatsschr. Kakteenk. 24: 53, as *Mammillaria guerkeana:* Alianza Cientifica Universal 3: pl. opp. 119, as *Mammillaria valida.*

8. Coryphantha echinoidea (Quehl).

Mammillaria echinoidea Quehl, Monatsschr. Kakteenk. *23:* 42. 1913.

Plant solitary, globular or a little broader than high, 5 to 6 cm. in diameter, very woolly at apex; tubercles conic, 1.5 cm. high, 1.2 cm. broad at base; groove with 1 to 3 small, grayish glands; areoles elliptic, woolly when young, glabrate in age; radial spines 20 to 25, 1.5 cm. long, white with darker tips; central spines 1 to 3, a little stouter than the radials, one of them porrect, horn-colored; flowers rose-colored, 6 to 8 cm. broad; perianth-segments oblong, broad at apex, denticulate, sometimes mucronate; filaments numerous, red; fruit and seed unknown.

Type locality: Durango.

Distribution: Durango, Mexico.

Illustration: Monatsschr. Kakteenk. 23: 42, as *Mammillaria echinoidea.*

9. Coryphantha clava (Pfeiffer) Lemaire, Cactées 34. 1868.

Mammillaria clava Pfeiffer, Allg. Gartenz. *8:*282. 1840.
Mammillaria schlechtendalii Ehrenberg. Linnaea *14:* 377. 1840.
Mammillaria schlechtendalii levior Salm-Dyck. Cact. Hort. Dyck. 1849. 127. 1850.
Echinocactus clavus Poselger, Allg. Gartenz. *21:* 125. 1853.
Echinocactus schlechtendalii Poselger, Allg. Gartenz. *21:* 125. 1853.
Cactus clavus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus schlechtendalii Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Plant-body club-shaped, deep green; axils of tubercles with white wool and with a red gland at base of groove; tubercles erect, elongated, somewhat 4-sided; spine-areoles white-villous; radial spines usually 7, straight, horn-colored, about equal; central spine 1, a little longer and stouter than the others; flowers very large, sometimes 9 cm. broad, pale yellow, with the outer segments tinged with red; perianth-segments glossy, linear-oblong to spatulate, outer ones entire, inner ones serrate and mucronate at apex; filaments orange; stigma-lobes 6, linear, yellow.

Type locality: Mexico.

Distribution: Mexico.

Coryphantha schlechtendalii Lemaire(Cactées 34. 1868) is usually given as a synonym of this species.

Illustrations: Curtis's Bot. Mag. 74: pl. 4358; Loudon, Encycl. Pl. ed. 3. 1379. f. 19390, as *Mammillaria clava.*

10. Coryphantha octacantha (De Candolle).

Mammillaria octacantha De Candolle, Mém. Mus. Hist. Nat. Paris *17:* 113. 1828.
Mammillaria leucacantha De Candolle, Mém. Mus. Hist. Nat. Paris *17:* 113. 1828.
Mammillaria lehmanni Otto in Pfeiffer, Enum. Cact. 23. 1837.
Mammillaria macrothele Martius in Pfeiffer, Enum. Cact. 24. 1837.
Mammillaria plaschnickii Otto in Pfeiffer, Enum. Cact. 24. 1837.
Mammillaria aulacothele Lemaire, Cact. Aliq. Nov. 8. 1838.
Mammillaria biglandulosa Pfeiffer, Allg. Gartenz. *6:* 274. 1838.
Mammillaria sulcimamma Pfeiffer, Allg. Gartenz. *6:* 274. 1838.
Mammillaria lehmannii sulcimamma Miquel, Linnaea *12:* 9. 1838.
Mammillaria martiana Pfeiffer, Linnaea *12:* 140. 1838.
?*Mammillaria thelocamptos* Lehmann, Linnaea *13:* Litt. 101. 1839.
Mammillaria aulacothele multispina Scheidweiler, Bull. Acad. Aci. Brux. *6:* 92. 1839.
Mammillaria aulacothele spinosior Monville in Lemaire, Cact. Gen. Nov. Sp. 93. 1839.
Mammillaria aulacothele sulcimamma Pfeiffer in Walpers, Bot. Repert. *2:* 302. 1843.
Mammillaria aulacothele flavispina Salm-Dyck, Cact. Hort. Dyck. 1844. 13. 1845.
Mammillaria polymorpha Scheer in Mühlenpfordt, Allg. Gartenz. *14:* 373. 1846.
Mammillaria macrothele lehmanni Salm-Dyck, Cact. Hort. Dyck. 1849. 19. 1850.
Mammillaria macrothele biglandulosa Salm-Dyck, Cact. Hort. Dyck. 1849. 19. 1850.
Mammillaria plaschnickii straminea Salm-Dyck, Cact. Hort. Dyck. 1849. 19. 1850.
Echinocactus macrothele Poselger, Allg. Gartenz. *21:* 125. 1853.
Echinocactus plaschnickii Poselger, Allg. Gartenz. *21:* 125. 1853.
Echinocactus macrothele lehmanni Poselger, Allg. Gartenz. *21:* 125. 1853.
Echinocactus macrothele biglandulosus Poselger, Allg. Gartenz. *21:* 125. 1853.
Coryphantha lehmanni Lemaire, Cactées. 34. 1868.
Coryphantha aulacothele Lemaire, Cactées 34. 1868.
Cactus macrothele Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus aulacothele Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

Cactus biglandulosus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus lehmannii Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus plaschnickii Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus octacanthus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus martianus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Plant-body simple, cylindric, 3 dm. high, 12 to 15 cm. in diameter; axils of tubercles bearing white wool, the groove with 1 or 2 red glands; tubercles elongated, up to 25 mm. long, spreading, somewhat 4-angled but with broad bases; radial spines 8, spreading, rigid, horn-colored with black tips, 10 to 12 mm. long; central spines 1 or 2, stouter than the radials, brownish, 25 mm. long; flowers about 6 cm. broad, straw-colored; perianth-segments linear-oblong, obtuse; filaments reddish; style red; stigma-lobes yellow.

Type locality: Mexico.

Distribution: Central Mexico.

Mammillaria polymorpha Scheer (Mühlenpfordt, Allg. Gartenz. **14:** 373. 1846) is probably only an abnormal greenhouse form of this species.

Coryphantha aulacothele and *C. lehmanni* (Lemaire, Cactées 34. 1868) and *M. macrothele nigrispina* (Schelle, Handb. Kakteenk, 243. 1907) are only names but are usually referred here.

Mammillaria leucantha is credited to De Candolle by Steudel (Nom. ed. 2. **2:** 97. 1841), but we have not seen such a name used by De Candolle. It may be a misspelling for *M. leucacantha.* Steudel refers the name to *M. lehmannii.* while the Index Kewensis states that it equals *M. recurva.*

Cereus lehmannii Hortus is cited by Förster (Handb. Cact. 245. 1846) as a synonym of *M. lehmannii.*

Illustrations: Loudon, Encycl. Pl. ed. 2 and 3. 1201. f. 17362; Curtis's Bot. Mag. **65:** pl. 3634, as *Mammillaria lehmannii;* Monatsschr. Kakteenk. **20:** 85; Krook, Handb. Cact. 38, as *Mammillaria aulacothele;* Schelle, Handb. Kakteenk. 242. f. 161; Förster, Handb. Cact. ed. 2. 391. f. 39, as *Mammillaria macrothele.*

11. Coryphantha exsudans (Zuccarini) Lemaire.*

Mammillaria exsudans Zuccarini in Pfeiffer, Enum. Cact. 15. 1837.
Mammillaria brevimamma Zuccarini in Pfeiffer, Enum. Cact. 34. 1837.
Mammillaria glanduligera Otto and Dietrich, Allg. Gartenz. *16:* 298. 1848.
Mammillaria brevimamma exsudans Salm-Dyck, Cact. Hort. Dyck. 1849. 19. 1850.
Mammillaria asterias Cels in Salm-Dyck, Cact. Hort. Dyck. 1849. 129. 1850.
Echinocactus glanduligerus Poselger, Allg. Gartenz. *21:* 102. 1853.
Echinocactus brevimammus Poselger, Allg. Gartenz. *21:* 102. 1853.
Coryphantha glanduligera Lemaire, Cactées 34. 1868.
Coryphantha brevimamma Lemaire in Förster, Handb. Cact. ed. 2. 394. 1885.
Cactus brevimamma Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus exsudans Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus glanduliger Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

Subcylindric, 4 cm. in diameter; tubercles dull green, thick, ovate; glands in the axils of the tubercles pale yellow; spine-areoles somewhat tomentose, becoming naked; radial spines 6 or 7, 6 to 10 mm. long, slender, straight, spreading, yellow; central spine 1, erect, yellow but brown at tip, perhaps hooked; flowers yellow.

Type locality: Between Ixmiquilpan and Zimapán.

Distribution: Central Mexico.

All the synonyms cited above may or may not belong here. Our description is compiled mostly from Pfeiffer's.

Mammillaria curvata (Pfeiffer, Enum. Cact. 15. 1837) was given as a synonym of *Mammillaria exsudans.*

Illustrations: Monatsschr. Kakteenk. **23:** 147; Möllers Deutsche Gärt. Zeit. **25:** 475. f. 8, No. 30, as *Mammillaria glanduligera.*

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* This binomial is credited to Lemaire by Rümpler (Förster, Handb. Cact. ed. 2. 395. 1885), but as a synonym of *Mammillaria brevimamma exsudans.*

12. **Coryphantha erecta** Lemaire, Cactées 34. 1868.

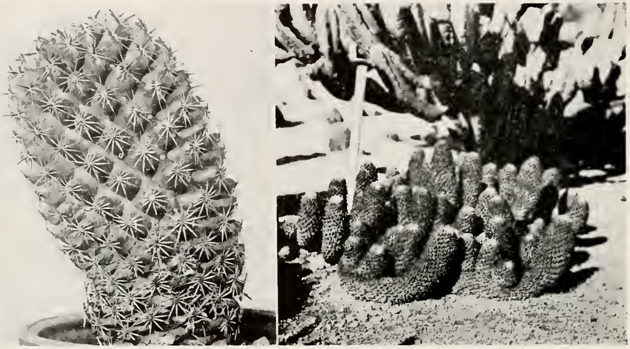
Mammillaria erecta Lemaire in Pfeiffer, Allg. Gartenz. *5:* 370. 1837.
Mammillaria ceratocentra Berg, Allg. Gartenz. *8:* 130. 1840.
Echinocactus erectus Poselger, Allg. Gartenz. *21:* 126. 1853.
Cactus erectus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus ceratocentrus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

Plant-body cylindric, yellowish green; axils of young tubercles white-woolly; tubercles obliquely conic, somewhat rhombiform at base; radial spines 8 to 14, subulate, ascending, yellowish; central spines 2, upper one short, lower one curved; flowers large, yellow; perianth-segments very narrow.

Type locality: Mexico.

Distribution: State of Hidalgo.

The plant described by Schumann has four central spines and may not belong to this species; his illustration answers it fairly well but does not show 4 centrals. We have recently examined specimens labeled *Mammillaria erecta* which were sent by Carl Ackerman, employed at the Huntington estate near Los Angeles, California; his plants grow in clumps one meter in diameter; the large branches are prostrate below, ascending or erect above, 3 dm. long; the spine-areoles are circular, white-felted when young; the spines are glossy yellow, the radials widely spreading; central spines often wanting or sometimes solitary, porrect, and shorter than the radials.



Figs. 30 and 31.—Coryphantha erecta.

Mammillaria evarescentis, according to Lemaire (Cact. Aliq. Nov. 4. 1838) was a garden name improperly applied to this species.

The three names *Mammillaria evanescens, M. evarescens,* and *M. evarascens* were listed as synonyms of *M. erecta* by Förster (Handb. Cact. 243. 1846).

Illustrations: Schumann, Gesamtb. Kakteen 504. f. 82; Möllers Deutsche Gärt. Zeit. **25:** 475. f. 8, No. 7; Lemaire, Icon. Cact. pl. 10, as *Mammillaria erecta.*

Figure 30 is from a photograph of a plant collected by Dr. Rose in Mexico in 1906 (No. 1072a) and figure 31 is from a photograph of a plant growing in the Huntington collection in southern California which was made by Ernest Braunton.

13. **Coryphantha elephantidens** Lemaire, Cactées 35. 1868.

Mammillaria elephantidens Lemaire, Cact. Aliq. Nov. 1. 1838.
Echinocactus elephantidens Poselger, Allg. Gartenz. *21:* 102. 1853.
Cactus elephantidens Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

Simple, subglobose, up to 14 cm. high and 19 cm. broad; tubercles very large, somewhat flattened, obtuse, 4 to 5 cm. long, densely woolly in the axils; areoles elliptic, when young woolly, in age naked; spines 8, all radial, somewhat unequal, subulate, the longest about 2 cm. long, spreading, when young brownish with yellowish bases, black at apex; flowers large, rose-colored, 11 cm. broad; perianth-segments numerous, narrowly oblong, apiculate.

Type locality: Not cited.

Distribution: Central Mexico, but Nicholson's Dictionary of Gardening says Paraguay in error.

This is a very characteristic plant but we know it only from illustrations. Walter Mundt once offered it for sale but his supply has been exhausted; he gives a good illustration of it in a group of cacti printed on his letter heads and he writes us that this plant has a large carmine flower.

Schelle (Handb. Kakteenk. 238. 1907) gives *M. elephantidens spinosissima* Rebut, without synonymy or description.

Illustrations: Dict. Gard. Nicholson **4:** 563. f. 33; Suppl. 516. f. 550; Förster, Handb. Cact. ed. 2. 397. f. 40; Hort. Univ. **1:** pl. 33; Pfeiffer, Abbild. Beschr. Cact. **2:** pl. 20; Rümpler, Sukkulenten 206. f. 117; Garden **1:** 396; Lemaire, Icon. Cact. pl. 2 [not pl. 3]; Herb. Génér. Amat. II. **2:** pl. 17; Palmer. Cult. Cact. 111; Ann. Rep. Smiths. Inst. **1908:** pl. 14, f. 3; Goebel, Pflanz. Schild. **1:** f. 34; Blanc, Cacti 68. No. 1224; Watson, Cact. Cult. 159. f. 60; Bergen in Rother, Praktischer Leitfaden Kakteen 5 ed. 1. 65; ed. 3. f. 38, as *Mammillaria elephantidens.*

14. **Coryphantha bumamma** (Ehrenberg).

Mammillaria bumamma Ehrenberg, Allg. Gartenz. *17:* 243. 1849.
Mammillaria elephantidens bumamma Schumann, Keys Monogr. Cact. 43. 1903.

Globular or somewhat depressed; tubercles few, very large, rounded at apex, bluish green, very woolly in their axils when young but glabrate in age; spines 5 to 8, subulate, grayish brown, more or less recurved, 2 cm. long or more, all radial; flower large, yellow, 5 to 6 cm. broad; inner perianth-segments narrowly oblong, obtuse or retuse.

Type locality: Mexico.

Distribution: Mexico.

This plant is perhaps nearest *Coryphantha elephantidens,* to which it was referred as a variety, but the flowers are much smaller and nearly yellow. Mundt states that the flowers are smaller but bright rose with a dark stripe. His plant, however, is not now in his possession.

The plants are often much depressed, arising only a little above the surface of the ground, and are firmly anchored in the soil by a thick root, almost equal in diameter to that of the stem itself.

Dr. Rose made two collections in Mexico which we would refer here, one on the pedregal near Yautepec, Morelos (No. 8530), and the other at Iguala, Guerrero (No. 9320).

Illustration: Engler and Prantl, Pflanzenfam. 3^{6a}: 194. f. 67, as *Mammillaria bumamma.*

Plate v, figure 6, shows a plant collected by H. H. Rusby at Lemon Mountain, Guerrero, altitude 800 meters, July 28, 1910 (No. 4), which flowered in the New York Botanical Garden, September 11, 1911. Figure 29 is from a photograph showing a top view of a plant collected by Dr. C. Reiche at Iguala, Mexico, in 1921.

15. **Coryphantha robustispina** (Schott).

Mammillaria robustispina Schott in Engelmann, Proc. Amer. Acad. *3:* 265. 1856.
Cactus robusispinus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Mammillaria brownii Toumey, Bot. Gaz. *22:* 253. 1896.
Cactus brownii Toumey, Bot. Gaz. *22:* 253. 1896.

Stems solitary or clustered, globular or a little longer than thick, 5 to 15 cm. high, densely armed and almost hidden by the spines; tubercles large, 2.5 to 2.8 cm. long, arranged in 13 somewhat spiraled rows, fleshy, in age thickly set one against the other, becoming more or less dorsally flattened, pale, grayish green, narrowly grooved; radial spines 12 to 15, the 3 lower very stout, brownish, the upper generally weaker, the 2 or 3 uppermost ones much weaker, clustered closely together and very pale, some of them sometimes crowded towards the center, the central spine solitary, very stout and erect or sometimes curved or even hooked, yellow, 3.5 cm. long; all the larger spines somewhat bulbous at base; flowers 5 to 6 cm. long, salmon-colored; ovary 20 to 25 mm. long, bearing 4 to 7 minute caducous scales; fruit narrowly oblong, 6 cm. long; seeds large, 3 mm. long, shining.

Type locality: Cited as Sonora in first publication of species; afterwards as south side of the Baboquivari Mountains in northern Sonora.

Distribution: Mountains of southern Arizona, southwestern New Mexico, and northern Sonora.

We have followed Mrs. K. Brandegee in referring *Mammillaria brownii* here, for not only do the original descriptions read much alike but the type localities for the two are in the same mountain range. *M. brownii* was described from a very small plant and differs considerably from mature individuals. Engelmann calls attention to the very large seeds, which he says are "larger than those of any other *Mammillaria* examined." He also states, "embryo with some albumen, curved; cotyledon foliaceous, approaching the structure of the seed of most *Echinocacti*."

Dr. Shreve reports that the flowers appear in the summer and the fruits, which follow, hold over the following winter, gradually drying up. The fruits do not open by a basal pore as in other related species.

We would refer here specimens from Lordsburg, New Mexico, and Bowie, Arizona, which, have heretofore been referred to *Mammillaria valida*, now *Coryphantha muehlenpfordtii*.

Illustrations: Bot. Gaz. 22: 254, as *Mammillaria brownii;* Cact. Journ. 1: 85; Cact. Mex. Bound. pl. 74, f. 8, as *Mammillaria robustispina*.

16. Coryphantha connivens sp. nov.

Globular or somewhat depressed, 8 to 10 cm. broad, somewhat woolly at the crown at flowering time but becoming glabrate; spines all radial but of two kinds; one kind 5 or 6, spreading or curved backward, subulate, horn-colored, the other 8 to 10, from upper part of spine-areole, clustered, erect, or toward top connivent, acicular, black at tip; flowers yellow, 6 to 7 cm. broad; perianth-segments narrowly oblong, acuminate; fruit greenish, oblong, 3 cm. long; seeds brown, oblong, 2 mm. long.

This species is common in the Valley of Mexico, especially on the pedregal. Dr. Rose collected it first in 1901 and again in 1905 and 1906; the type is his No. 8372 from near Tlalpam, collected in 1905. Dr. C. Reiche also collected it between Tacubaya and Santa Fé in 1922, and according to him the plant from this locality is the one referred to *Mammillaria pycnacantha* by Schumann (Gesamtb. Kakteen 489. 1898).

The species is characterized by the peculiar clusters of spines in the upper angle of the areoles. A small plant was sent by O. Solis from Tlalpam in 1907, but it has fewer acicular spines than described above.

17. Coryphantha pectinata (Engelmann).

Mammillaria pectinata Engelmann, Proc. Amer. Acad. *3:* 266. 1856.
Mammillaria pectinata cristata Hortus in Förster, Handb. Cact. ed. 2. 403. 1885.
Cactus pectinatus Kuntze, Rev. Gen. Pl. *1:* 259. 1891.

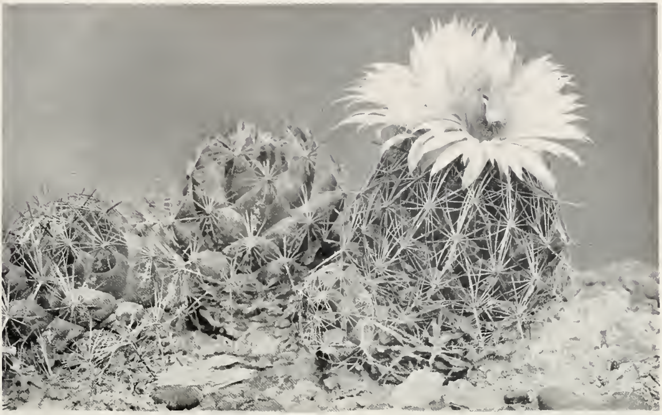
Usually simple, globose, 3 to 6 cm. in diameter; tubercles usually arranged in 13 spirals; upper tubercles 10 to 12 mm. long, about twice as long as lower ones; areoles a little longer than broad; spines 16 to 24, all radial, those on lower areoles appressed and often a little recurved, those from upper part of upper areoles 12 to 18 mm. long, connivent over apex, yellowish white with black tips; flowers yellow, 5 cm. long; ovary 6 to 8 mm. long; fruit 12 mm. long.

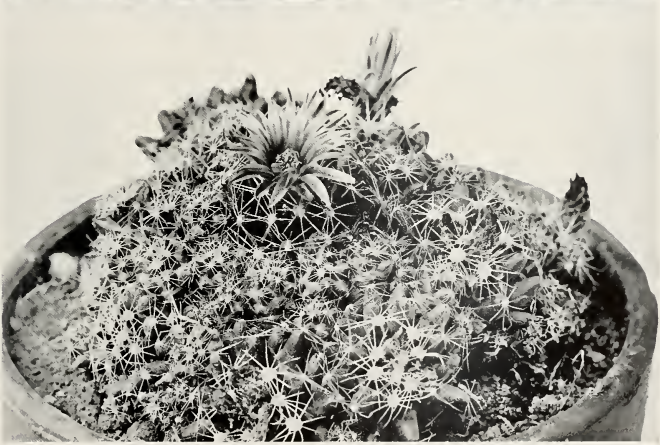
Type locality: On the Pecos River in western Texas.

Distribution: Southern Texas and adjacent parts of Mexico.

Coulter and Schumann refer it to *Mammillaria radians* De Candolle, but it doubtless is a distinct species.

This plant is well illustrated by Engelmann and should be easily recognized. It appears to have been collected only rarely. The only representatives we have of it are flowers and a





Coryphantha nickelsae, from Monterey, Mexico.
Neobesseya similis, from Texas.

spine-cluster from the herbarium of J. W. Toumey, collected in his cactus garden at Tucson, June 12, 1896, and a small specimen from near the type locality obtained by Vernon Bailey, March 22, 1890, and more recently by Fisher at Langtry, Texas.

Illustrations: Cact. Journ. **1:** 114; **2:** 6; Dict. Gard. Nicholson Suppl. 514. f. 546; Förster, Handb. Cact. ed. 2. 402. f. 42; Rümpler, Sukkulenten 204. f. 115; Journ. Hort. Home Gard. III. **46:** 379; Cact. Mex. Bound. pl. 11; Watson, Cact. Cult. 169. f. 67; ed. 3. f. 44; West Amer. Sci. **13:** 40; Blanc, Cacti 73. No. 1459; Cassell's Dict. Gard. 2: 48; Remark, Kakteenfreund 15, as *Mammillaria pectinata;* Schelle, Handb. Kakteenk. 240. f. 158, as *M. radians impexicoma* [Schelle's illustration is the same as Engelmann's].

Figure 31*a* is from a photograph of a plant obtained by George L. Fisher near Langtry, Texas, in 1922.

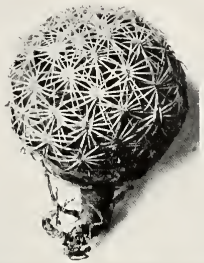


FIG. 31*a*.—Coryphantha pectinata.

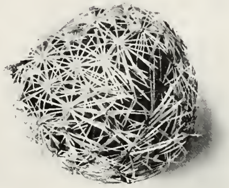


FIG. 31*b*.—Coryphantha echinus.

18. Coryphantha nickelsae (K. Brandegee).

Mammillaria nickelsae K. Brundegee, Zoe *5:* 31. 1900.

Described as globular, densely cespitose, often 7 cm. high, pale green and glaucous; older plants becoming purplish; tubercles almost hidden by the overlapping spines, rather broad at base, low, not densely arranged; spines 14 to 16, all radial (a few forming a small fascicle at top of groove), slender, at first simply spreading but afterward bent back and interlaced with those of adjoining tubercles, 8 to 10 mm. long, at first yellowish at base with dark tips, but afterwards bleaching; flowers described as bright yellow, with a red center, 5 to 7 cm. broad; fruit nearly globular, 5 to 7 mm. long, green; seeds small, brown.

Type locality: Mexico, southward from Laredo, Texas.

Distribution: Northern Nuevo León, Mexico.

Plants collected by Robert Runyon in March 1921, on Mount La Mitra, near Monterey, which we believe should be referred here, deserve some detailed description. They grow in clusters of 4 to 12. From the axils of the lower tubercles near the surface of the ground numerous young plants or buds originate; the young spines are pale yellow, with reddish-brown tips, in age some bleaching white, others brownish to nearly black throughout; many of the first areoles have only radial spines but old plants often have one central spine 1.5 to 2 cm. long, from all the upper areoles; flowers large, light yellow; inner perianth-segments spreading, linear-lanceolate, acuminate; anthers bright yellow.

Plate III, figure 1, is from a photograph of the plant collected by Mr. Runyon, which was made at his home in Brownsville, Texas, September 15, 1921. Figure 32 is from a photograph of a specimen sent us by Dr. Richard E. Kunze in 1911.

19. Coryphantha compacta (Engelmann).

Mammillaria compacta Engelmann in Wislizenus, Mem. Tour North. Mex. 105. 1848.
Cactus compactus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

Plants solitary, somewhat depressed, 3 to 6 cm. high, 5 to 8 cm. broad; tubercles in 13 rows, much crowded, 8 mm. long, sulcate above; radial spines 14 to 16, rigid, appressed, interwoven with adjacent ones, whitish, 10 to 20 mm. long; central spines usually wanting; flowers 2 cm. long and broad, yellow; fruit oval; seeds smooth and yellow.

Type locality: Cosihuiriachi, Chihuahua.

Distribution: Mountains of Chihuahua.

This species had long been known only from the original plant collected by Wislizenus, but in 1908 Dr. Rose visited the type locality, where he re-collected the plant, which later flowered at Washington.

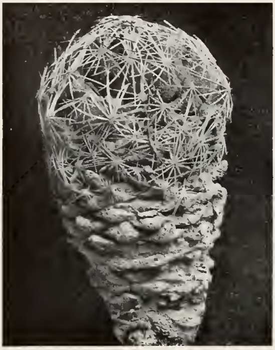


FIG. 32.—Coryphantha nickelsae.

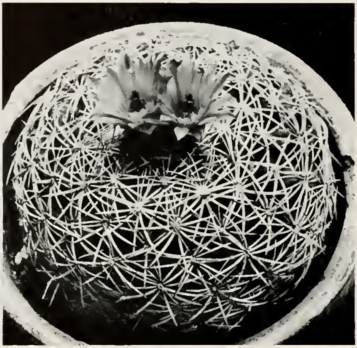


FIG. 33.—Coryphantha compacta.

The name *Coryphantha compacta* occurs in C. R. Orcutt's Circular to Cactus Fanciers, 1922.

Illustrations: Cact. Mex. Bound. pl. 74, f. 2 (seeds); Dict. Gard. Nicholson Suppl. 515. f 548; Bull. U. S. Dept. Agr. Bur. Pl. Ind. **262:** pl. 2, f. 1; Watson, Cact. Cult. ed. 2. 254. f. 95; ed. 3. 76. f. 35, as *Mammillaria compacta.*

Figure 33 is from a photograph of the plant collected by Dr. Rose.

20. Coryphantha radians (De Candolle).

Mammillaria radians De Candolle, Mém. Mus. Hist. Nat. Paris *17:* 111. 1828.
Mammillaria impexicoma Lemaire, Cact. Aliq. Nov. 5. 1838.
Mammillaria daimonoceras Lemaire, Cact. Aliq. Nov. 5. 1838.
Mammillaria radians globosa Scheidweiler, Bull. Acad. Sci. Brux. *5:* 494. 1838.
Mammillaria cornifera impexicoma Salm-Dyck, Cact. Hort. Dyck. 1849. 20. 1850.
Echinocactus corniferus impexicomus Poselger, Allg. Gartenz. *21:* 102. 1853.
Echinocactus radicans Poselger, Allg. Gartenz. *21:* 107. 1853.
Coryphantha daimonoceras Lemaire, Cactées 35. 1868.
Cactus radians Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus radians pectinoides Coulter, Contr. U. S. Nat. Herb. *3:* 114. 1894.
Mammillaria radians impexicoma Schumann, Gesamtb. Kakteen 495. 1898.
Mammillaria radians daemonoceras Schumann, Gesamtb. Kakteen 496. 1898.

Solitary, globose, either obtuse or depressed at the top, 7.5 cm. in diameter; tubercles ovoid, large; axils of tubercles naked; areoles glabrate; spines all radial, 16 to 18, white or sometimes yellowish, 10 to

12 mm. long, rigid, tomentose when young; flowers lemon-yellow, with outer segments tinged with red, about 10 cm. broad, the segments narrowly oblong to spatulate, acute, somewhat toothed toward the apex.

Type locality: Mexico.

Distribution: Central Mexico.

It is difficult to ascertain what the true *Mammillaria radians* of De Candolle really is. The type plant was described from specimens collected by Thomas Coulter, probably in eastern Mexico. We believe that specimens collected by Dr. Edward Palmer near San Luis Potosí, Mexico, represent the species as well as any plants we have yet seen; these, however, are cespitose as well as solitary. The species seems nearest *Coryphantha compacta.*

Cactus radians pectinoides Coulter, based on Eschanzier's plant from San Luis Potosí (1891), we have not seen but suspect that it belongs here.

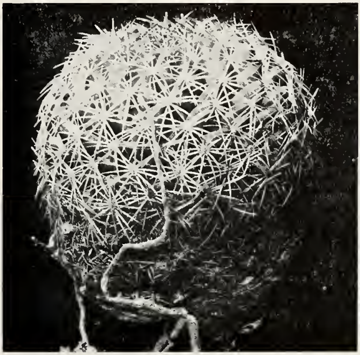


Fig. 34.—Coryphantha radians.

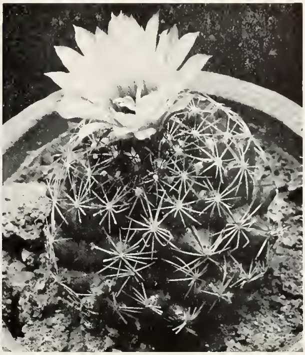


Fig. 35.—Coryphantha sulcolanata.

Mammillaria monoclova is only a garden name cited by Schumann (Gesamtb. Kakteen 495. 1898) as a synonym of this species.

Coryphantha impexicoma, credited to Lemaire, is given as a synonym of *Mammillaria cornifera impexicoma* Salm-Dyck by Rümpler (Förster, Handb. Cact. ed. 2. 414. 1885).

Illustrations: Blühende Kakteen **2:** pl. 102; Tribune Hort. **4:** pl. 139; Succulenta **5:** 57, as *Mammillaria radians;* Monatsschr. Kakteenk. **15:** 7, as *M. radians impexicoma.*

Figure 34 is from a photograph of the plant collected at San Rafael by Dr. Chaffey in 1910.

21. Coryphantha sulcolanata Lemaire, Cactées 35. 1868.

Mammillaria sulcolanata Lemaire, Cact. Aliq. Nov. 2. 1838.
Echinocactus sulcolanatus Poselger, Allg. Gartenz. *21:* 102. 1853.
Mammillaria conimamma Linke, Allg. Gartenz. *25:* 239. 1857.
Mammillaria cornimamma N. E. Brown, Gard. Chron. III. *2:* 186. 1887.
Cactus sulcolanatus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Subglobose, somewhat depressed, cespitose, 5 cm. high, 6 cm. thick or more; tubercles somewhat 5-angled at base, subconic above, their axils very woolly when young; spines 9 or 10, all radial, unequal, 12 to 16 mm. long, the lower and upper weaker and shorter than the lateral ones, brownish with black tips, but when young whitish yellow with purple tips; flowers large, 4 cm. long or more, widely spreading, 6 cm. broad or more; perianth-segments oblong, acute.

Type locality: Not cited, but Rümpler states that the plant was collected by Galeotti near Mineral del Monte, Hidalgo, in 1836.

Distribution: Mexico, perhaps Hidalgo, but definite range unknown.

Aulacothele sulcolanatum Monville (Lemaire, Icon. Cact. pl. 10. 1841-1847), referred here as a synonym, seems never to have been published.

Mammillaria retusa Scheidweiler is sometimes referred here also and the name has priority over *M. sulcolanata*, but we are treating it as distinct.

Echinocactus conimamma Linke was cited by Schumann (Monatsschr. Kakteenk. **5:** 75. 1895) by mistake for *Mammillaria conimamma* Linke. *M. conimamma major* is listed by Haage (Cact. Kultur ed. 2. 179. 1900).

The name *Mammillaria sulcolanata macracantha* (Walpers, Repert. Bot. **2:** 273. 1843) was without description.

Illustrations: Haage, Cact. Kultur ed. 2. 178, as *Mammillaria bumamma;* Blanc, Hints on Cacti 68. No. 1224, as *Mammillaria elephantidens;* Lemaire, Icon. Cact. pl. 10; Förster, Handb. Cact. ed. 2. 408. f. 45; Schelle, Handb. Kakteenk. 238. f. 154; Watson, Cact. Cult. 178. f. 72; ed. 3. f. 49; Deutsche Gärt. Zeit. **6:** 65; Dict. Gard. Nicholson **4:** 565. f. 40; Suppl. 518. f. 558, as *Mammillaria sulcolanata;* Möllers Deutsche Gärt. Zeit. **25:** 475. f. 8, No. 2, as *Mammillaria conimamma;* Lemaire, Cactées 35. f. 2.

Figure 35 is from a photograph of the plant collected by Dr. Rose near Pachuca in 1905.

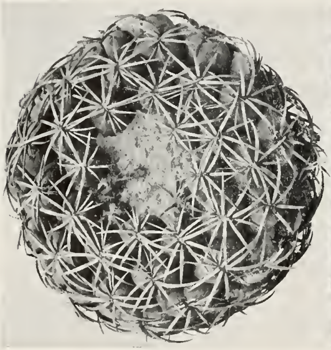


FIG. 36.—Coryphantha retusa.

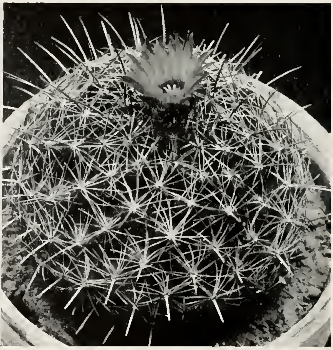


FIG. 37.—Coryphantha salm-dyckiana.

22. Coryphantha retusa (Pfeiffer).

Mammillaria retusa Pfeiffer, Allg. Gartenz. *5:* 369. 1837.
Cactus retusus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Plants depressed-globose, 5 to 10 cm. in diameter, the top very woolly; tubercles rather large; areoles elliptic; spines 6 to 12, all radial, appressed, or even curved backward, yellowish to brownish, subulate, except 2 or 3 acicular ones at upper part of areoles; flowers central, yellow, about 3 cm. long; inner perianth-segments oblong, acute.

Type locality: Mexico.

Distribution: Oaxaca, Mexico.

We have referred to this species a plant common in Oaxaca, which answers the original description very well. It was collected by Pringle in 1894 (No. 5706) and by Conzatti in

1907, 1909, and 1920. It has also been sent us from the same region by O. Solis and B. P. Reko.

Figure 36 is from a photograph of a plant sent from Oaxaca by O. Solís in 1920.

23. Coryphantha palmeri sp. nov.

Plant-body globular; tubecles closely set in about 13 rows but not very regularly arranged, pale green, not very flaccid; radial spines 11 to 14, rather stout, spreading nearly at right angles to central one, yellowish; tips often blackish; central spine one, stout, terete, hooked at apex; young areoles very woolly; flowers central, pale yellow to nearly white, about 3 cm. long; outer perianth-segments linear-oblong, acute, brownish on broad mid-rib, entire, the inner yellow throughout, acuminate; stamens numerous; stigma-lobes 9, linear, cream-colored.

Collected by Dr. Edward Palmer on stony ridge near Durango, Mexico, and flowered in Washington, July 1906 (No. 557, type). Here seem to belong plants collected by Dr. Palmer at Agua Nueva, April 1905 (No. 561), and at Saltillo, October 1904 (No. 438), and July 1905 (No. 703), and also by F. E. Lloyd in Zacatecas, 1908 (No. 9).

24. Coryphantha cornifera (De Candolle) Lemaire, Cactées 35. 1868.

Mammillaria cornifera De Candolle, Mém. Mus. Hist. Nat. Paris *17:* 112. 1828.
Mammillaria pfeifferana De Vriese, Tydschr. Nat. Geschr. *6:* 51. 1839.
Mammillaria scolymoides Scheidweiler, Allg. Gartenz. *9:* 44. 1841.
Mammillaria scolymoides longiseta Salm-Dyck, Cact. Hort. Dyck. 1849. 132. 1850.
Mammillaria scolymoides nigricans Salm-Dyck, Cact. Hort. Dyck. 1849. 132. 1850.
Echinocactus corniferus Poselger, Allg. Gartenz. *21:* 102. 1853.
Echinocactus corniferus longisetus Poselger, Allg. Gartenz. *21:* 102. 1853.
Echinocactus corniferus nigricans Poselger, Allg. Gartenz. *21:* 102. 1853.
Echinocactus corniferus scolymoides Poselger, Allg. Gartenz. *21:* 102. 1853.
Cactus corniferus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus pfeifferanus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus scolymoides Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Plant solitary, globose, pale green; tubercles short, broad, somewhat imbricated, 12 cm. high; radial spines 16 or 17, grayish, 10 to 12 mm. long; central spine 1, stout, erect or subincurved, generally dark colored, 14 to 16 mm. long; flowers yellow, tinged with red, 7 cm. broad; inner perianth-segments oblanceolate, acuminate; fruit not seen.

Type locality: Mexico.

Distribution: Central Mexico.

We refer here a plant collected by Dr. Rose near San Juan del Rio, August 17, 1905.

Schumann referred *Mammillaria scolymoides* to *Mammillaria radians,* but its relationship is rather with *M. cornifera* as suggested by Schumann.

Mammillaria cornifera mutica Salm-Dyck (Cact. Hort. Dyck. 1849. 20. 1850), taken up afterwards as *Echinocactus corniferus muticus* by Poselger (Allg. Gartenz. **21:** 102. 1853), was without description and to it was referred *Mammillaria radians* Hortus.

Illustrations: Schumann, Gesamtb. Kakteen 492. f. 81; Thomas, Zimmerkultur Kakteen 55; Bull. U. S. Dept. Agr. Bur. Pl. Ind. **262:** pl 1; Blühende Kakteen **3:** pl. 125; Monatsschr. Kakteenk. **14:** 73, as *Mammillaris cornifera;* Karsten and Schenck, Vegetationsbilder **2:** pl. 20e, as *Mammillaria scolymoides;* Tydschr. Nat. Geschr. **6:** pl. 1, f. 2, as *Mammillaria pfeifferana.*

Plate II, figure 4, shows a plant collected by Dr. C. A. Purpus in Coahuila in 1905 which flowered in the New York Botanical Garden.

25. Coryphantha salm-dyckiana (Scheer).

Mammillaria salm-dyckiana Scheer in Salm-Dyck, Cact. Hort. Dyck. 1849. 134. 1850.
Mammillaria salm-dyckiana brunnea Salm-Dyck, Allg. Gartenz. *18:* 394. 1850.
Echinocactus salm-dyckianus Poselger, Allg. Gartenz. *21:* 102. 1853.
Cactus salm-dyckianus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Mammillaria delaetiana Quehl, Monatsschr. Kakteenk. *18:* 59. 1908.

Plants either solitary or in clusters, nearly globular or sometimes club-shaped, 10 to 15 cm. in diameter, light green; tubercles rather short, closely set; radial spines about 15, spreading, slender, 10 to 15 mm. long, grayish or whitish; central spines 1 to 4, reddish to black, the 3 upper ones when present ascending and those near top of plant connivent, the lowest central stouter than others, 2 to 2.5 cm. long, porrect or curved downward; flowers large, 4 cm. long; outer perianth-segments greenish or tinged with red, the inner pale yellow; filaments greenish yellow; stigma-lobes 7.

Type locality: Near Chihuahua, Mexico.

Distribution: Common in the state of Chihuahua, Mexico.

Mammillaria salm-dyckiana was originally collected by John Potts near Chihuahua City and sent to Kew; its flowers and fruit were unknown. Schumann referred it as a synonym of *M. scheeri,* but we believe that it must be distinct and that *M. delaetiana* is the same. It was described from plants distributed by de Laet, who probably obtained them from C. R. Orcutt.

In 1908 Dr. E. Palmer collected some fine plants near Chihuahua City, from which our flower characters have been drawn.

Illustrations: Monatsschr. Kakteenk. **18:** 59; **20:** 92, as *Mammillaria delaetiana.*

Figure 37 is from a photograph of the plant collected by Dr. E. Palmer near Chihuahua City in 1908.

26. Coryphantha pallida sp. nov.

Plants either solitary or in clusters of about 10 or more, globular, 12 cm. in diameter or less, bluish green; tubercles in 13 rows, short and thick, closely set; radial spines 20 or more, white, appressed; centrals usually 3, but sometimes more, the two upper more or less ascending, the lower porrect or curved downward, with tip black, or sometimes black throughout; flowers very large, often 7 cm. long and nearly as broad; outer perianth-segments narrow, greenish yellow, with a reddish stripe on back; inner perianth-segments pale lemon-yellow, broader than outermost, acuminate; ovary bearing a few narrow scales; stamens deep red, numerous; style yellow, longer than stamens; stigma-lobes 9; fruit greenish brown, 2 cm. long; seeds brown, shining, broader at apex than below.

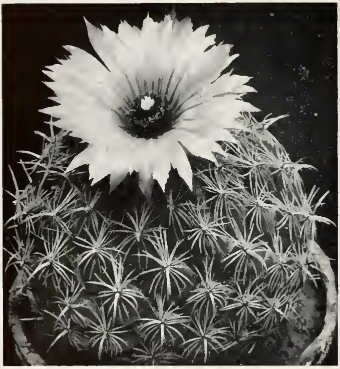


FIG. 38.—Coryphantha pallida.

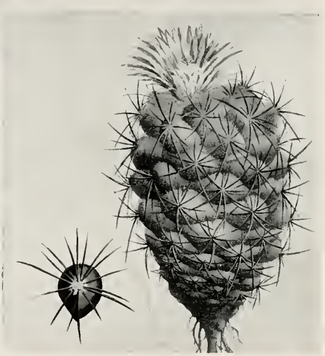


FIG. 39.—Coryphantha pycnacantha.

Common in calcareous soil about Tehuacán, Mexico. Collected by J. N. Rose in 1901 (No. 5583, type), in 1905 (Nos. 99972 and 10001), and in 1906. Living specimens were also obtained and these have flowered repeatedly in cultivation. It was also collected by C. G. Pringle in 1901 (No. 8573) and distributed as *Mammillaria pycnacantha?.*

In young plants the spines are not so numerous, the central spine is single, porrect, slightly curved, with black tips.

Figure 38 is from a photograph of the plant collected at the type locality in 1906.

27. Coryphantha pycnacantha (Martius) Lemaire, Cactées 35. 1868.

?*Mammillaria latimamma* De Candolle, Mém. Mus. Hist. Nat. Paris *17:* 114. 1828.
Mammillaria pycnacantha Martius, Nov. Act. Nat. Cur. *16:* 325. 1832.
?*Mammillaria acanthostephes* Lehmann, Allg. Gartenz. *3:* 228. 1835.
Mammillaria arietina Lemaire * Cact. Aliq. Nov. 10. 1838.
Mammillaria scepontocentra Lemaire, Cact. Gen. Nov. Sp. 43. 1839.
Mammillaria arietina spinosior Lemaire, Cact. Gen. Nov. Sp. 94. 1839.
Mammillaria pycnacantha spinosior Monville in Salm-Dyck, Cact. Hort. Dyck. 1844. 14. 1845.
Mammillaria magnimamma arietina Salm-Dyck in Förster, Handb. Cact. 235. 1846.
Mammillaria winkleri Förster, Allg. Gartenz. *15:* 50. 1847.
Mammillaria magnimamma lutescens Salm-Dyck, Cact. Hort. Dyck. 1849. 17, 121. 1850.
Echinocactus winkleri Poselger, Allg. Gartenz. *21:* 102. 1853.
?*Echinocactus acanthostephes* Poselger, Allg. Gartenz. *21:* 102. 1853.
Echinocactus pycnacanthus Poselger, Allg. Gartenz. *21:* 102. 1853.
Mammillaria acanthostephes recta Hortus in Labouret, Monogr. Cact. 138. 1853.
?*Coryphantha acanthostephes* Lemaire, Cactées 35. 1868.
Cactus acanthostephes Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus latimamma Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus pycnacanthus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus scepontocentrus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus winkleri Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Plant solitary, globular to cylindric, about 8 cm. high; tubercles broad, grooved above, glaucous-green; radial spines 10 to 12, slender, 10 to 16 mm. long; central spines about 4, stouter than the radials, about 25 mm. long, more or less curved backward, usually black; flowers from near center of plant, 25 mm. in diameter, yellowish; perianth-segments numerous, very narrow; stigma-lobes 5 or 6, white.

Type locality: Near the city of Oaxaca, Mexico.

Distribution: Oaxaca, Mexico.

The skeleton of the type of this species is preserved in the Munich Museum and Dr. Rose obtained a cluster of spines from this specimen in 1912.

Coryphantha pycnacantha has long been a desideratum. In September 1920 Professor Conzatti sent several small plants from near the type locality. In these, the radial spines are white, the central (3) are nearly black, and all more or less curved backward. In the center of the plant a quantity of white wool is developed, so abundant that it can be gathered for commercial use. With the specimens of Professor Conzatti are samples of the wool with an inquiry as to its value as a fiber.

Mammillaria magnimamma spinosior Lemaire (Salm-Dyck, Cact. Hort. Dyck. 1844. 12. 1845) was not described at the place here cited. Labouret afterwards refers it as a synonym of *M. magnimamma lutescens.*

Mammillaria cephalophora Salm-Dyck (Cact. Hort. Dyck. 1849. 137. 1850; *Echinocactus cephalophorus* Poselger, Allg. Gartenz. **21:** 102. 1853; *Cactus cephalophorus* Kuntze, Rev. Gen. Pl. **1:** 260. 1891) was a new name for *Melocactus mammillariaeformis* † Salm-Dyck (Allg. Gartenz. **4:** 148. 1836). It was first described as a *Melocactus* (because of its woolly crown), but it seems to be more like a *Coryphantha.* Its exact origin in Mexico seems to be unknown and the flowers had not been described up to 1850. Pfeiffer stated that the seeds obtained from a dead plant were similar to those of *Mammillaria coronaria.* Schumann discussed it under *M. pycnacantha* in a note. Hemsley (Biol. Centr. Amer. Bot. **1:** 502) listed it as a *Melocactus.*

Mammillaria pycnacantha scepontocentra Monville (Labouret, Monogr. Cact. 136. 1853) belong here by implication.

Mammillaria magnimamma Otto was referred by De Candolle (Mém. Cact. 17. 1834) to his *M. latimamma,* now referred to this species.

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* Schumann refers this name as a synonym of *Mammillaria centricirrha.*

† Schumann spells this name *Melocactus mamillariiformis.*

Echinocactus radiatus Hortus Belg. was referred as a synonym of *Mammillaria pycnacantha* by Pfeiffer (Enum. Cact. 180. 1837).

Illustrations: Nov. Act. Nat. Cur. **16:** pl. 17; Loudon, Encycl. Pl. ed. 3. 1379. f. 19387; Abh. Bayer. Akad. Wiss. München **2:** pl. 3; Pfeiffer and Otto, Abbild. Beschr. Cact. **1:** pl. 26; Curtis's Bot. Mag. **69:** pl. 3972, as *Mammillaria pycnacantha.*

Figure 39 is reproduced from the first illustration cited above; a spine-cluster is also shown.

28. Coryphantha echinus (Engelmann).

Mammillaria echinus Engelmann, Proc. Amer. Acad. *3:* 267. 1856.
Cactus echinus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Mammillaria radians echinus Schumann, Gesamtb. Kakteen 496. 1898.

Solitary, globose to subconic, 3 to 5 cm. in diameter, almost hidden under the closely appressed spines; areoles orbicular or a little longer than broad; radial spines numerous, white, 10 to 16 mm. long; central spines 3 or 4, the 3 upper erect or connivent over the apex, the lower one porrect on side of plant, erect near top, subulate, straight, 1.5 to 2.5 cm. long, often blackish; flowers 2.5 to 5 cm. long, yellow; outer perianth-segments linear-lanceolate; inner perianth-segments 20 to 30, narrow; stigma-lobes about 12; fruit oblong, 12 mm. long.

Type locality: On the Pecos River, Texas.

Distribution: Western Texas.

The flowers with the type plant seem to have been shriveled, for Engelmann describes them as large, apparently about 1½ or 2 inches long; in a later description he states that they are yellow. This species is very rare in collections and we have seen no flowers of it. All the illustrations cited below are based on the figure in the Mexican Boundary Survey.

The name *Coryphantha echinus* occurs in C. R. Orcutt's Circular to Cactus Fanciers, 1922.

Illustrations: Cact. Mex. Bound. pl. 10; Dict. Gard. Nicholson **4:** 562. f. 32; Suppl. 515. f. 549; Watson, Cact. Cult. 157. f. 59; ed. 3. f. 37; Förster, Handb. Cact. ed. 2. 404. f. 43; Blanc, Cacti 68. f. 1228, as *Mammillaria echinus;* Schelle, Handb. Kakteenk. 240. f. 159, as *M. radians echinus.*

Figure 31*b* is from a photograph of a plant obtained by George L. Fisher near Langtry, Texas, in 1922.

29. Coryphantha durangensis (Rünge).

Mammillaria durangensis Rünge in Schumann, Gesamtb. Kakteen 478. 1898.

Plants solitary or in small clusters, short-cylindric, 10 cm. long or less, somewhat glaucous; tubercles rather prominent, in 5 or 8 series, somewhat compressed dorsally, very woolly in the axils; radial spines 6 to 8, acicular, spreading, 1 cm. long or less; central spine solitary, often erect, those of uppermost areoles connivent, black; flowers very small, about 2 cm. long, when fully expanded 2.5 to 4 cm. broad; outer perianth-segments dark purple or with only a purple stripe down center; inner perianth-segments cream-colored to pale lemon-yellow; filaments cream-colored, about length of style; style and stigma-lobes cream-colored, the latter 5, linear and curved backward; fruit globular, 5 to 8 mm. in diameter, naked, greenish; seeds brown, about 1 mm. broad.

Type locality: Villa Lerdo, Durango, Mexico.

Distribution: Northern Mexico.

Dr. E. Chaffey has collected this plant for us several times at the type locality, but it does not survive long under glass. In 1911 he found a cristate form with the lobes flattened like the joints of an *Opuntia,* bearing flowers along the edges.

This is *Mammillaria compressa* of Hildmann's Catalogue, according to Schumann (Gesamtb. Kakteen 479. 1898).

Illustration: Wiener Ill. Gart. Zeit. **29:** 411, f. 105, as *Mammillaria radians.*

Plate v, figure 4, shows a plant sent by Dr. Chaffey from the type locality in 1918, which flowered in the New York Botanical Garden, April 8, 1918. Figure 40 is from a photograph of a potted plant sent by Dr. Chaffey in 1910 which flowered in Washington; figure 41 is from a photograph of another plant sent by Dr. Chaffey in 1910.

30. Coryphantha chlorantha (Engelmann).

Mammillaria chlorantha Engelmann in Rothrock, Rep. U. S. Geogr. Surv. *6:* 127. 1878.
Cactus radiosus chloranthus Coulter, Contr. U. S. Nat. Herb. *3:* 121. 1894.
Mammillaria radiosa chlorantha * Schumann, Gesamtb. Kakteen 481. 1898.

Plant cylindric, sometimes 20 to 25 cm. high, 8 cm. in diameter; tubercles closely set and entirely hidden by the densely matted spines; flowers small, 35 mm. broad; outer perianth-segments ciliate; inner perianth-segments yellow or greenish yellow, linear-lanceolate, acute; stigma-lobes white; fruit central, green, 2.5 cm. long, juicy, bearing 5 or 6 scales near top; seeds brown, flattened, 1.5 mm. long, reticulated.

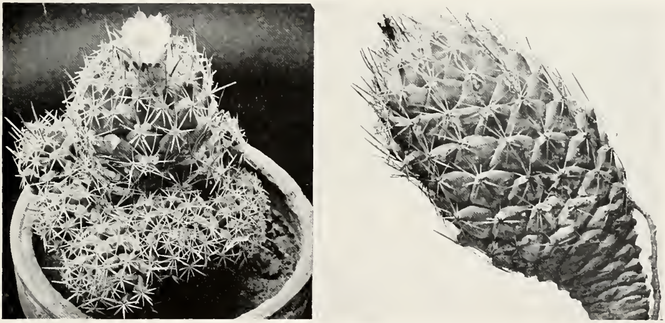
Type locality: Southern Utah, east of Saint George.

Distribution: Southern Utah, western Arizona, central Nevada, and eastern southern California.

Mammillaria utahensis Hildmann, cited by Schumann (Gesamtb. Kakteen 481. 1898) as a synonym of *M. radiosa,* may have been based on this plant.

Illustrations: Förster, Handb. Cact. ed. 2. 328. f. 33; Gartenflora 32: 87; Deutsche Gärt. Zeit. 7: 53, as *Mammillaria chlorantha;* Schelle, Handb. Kakteenk. 236. f. 151, as *M. radiosa chlorantha.*

Plate v, figure 7, is from a plant collected by I. Tidestrom at the type locality in 1919, which flowered in the New York Botanical Garden, May 27, 1919. Figure 42 is from a photograph of a plant collected by Major E. A. Goldman in Prospect Valley, Arizona.



Figs. 40 and 41.—Coryphantha durangensis.

31. Coryphantha vivipara (Nuttall) Britton and Rose in Britton and Brown, Illustr. Fl. ed. 2. 2: 571. 1913.

Cactus viviparus Nuttall, Fraser's Cat. No. 22. 1813.
Mammillaria vivipara Haworth, Suppl. Pl. Succ. 72. 1819.
Mammillaria radiosa Engelmann, Bost. Journ. Nat. Hist. *6:* 196. 1850.
Echinocactus radiosus Poselger, Allg. Gartenz. *21:* 107. 1853.
Echinocactus viviparus Poselger, Allg. Gartenz. *21:* 107. 1853.
Mammillaria vivipara vera Engelmann, Proc. Amer. Acad. *3:* 269. 1856.
Mammillaria vivipara radiosa Engelmann, Proc. Amer. Acad. *3:* 269. 1856.
Mammillaria vivipara radiosa Engelmann, Cact. Mex. Bound. 15. 1859, as subspecies.
Cactus radiosus Coulter, Contr. U. S. Nat. Herb. *3:* 120. 1894.
Mammillaria hirschtiana Haage, Monatsschr. Kakteenk. *6:* 127. 1896.
Coryphantha radiosa Rydberg, Fl. Rocky Mountains 581. 1917.

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* Schumann credits this trinomial to Engelmann at the place here cited, although we believe that Engelmann never used it.

Plants solitary or in clusters forming mounds 3 to 6 dm. in diameter, globular, with prominent tubercles; areoles large, woolly; radial spines about 16, rather delicate, radiating, white; centrals 4 to 6, divergent, much stouter, brownish, swollen at base; ovary green, naked; outer perianth-segments greenish; inner ones somewhat pinkish, long-ciliate; innermost perianth-segments pinkish purple, narrow, acuminate, entire, spreading; filaments much shorter than the segments, pinkish, but paler below; style greenish to purple above, longer than the stamens; stigma-lobes linear, purple, about 8, apiculate; fruit green when mature, juicy, nearly globular, 1.5 cm. in diameter, with several (sometimes 5 or 6) small ciliate scales scattered over its surface; seeds light brown, 1.5 mm. long.

Type locality: "Near the Mandan towns on the Missouri, lat. near 49°."

Distribution: Manitoba to Alberta, Kansas, south to northern Texas and Colorado.

The group to which *Coryphantha vivipara* belongs has always been very puzzling. Dr. Engelmann, our greatest authority on this group, was sometimes of one opinion and sometimes of another. Schumann rejected the specific name *vivipara* of Haworth for this plant since he thought that it was not the same as the *vivipara* of Engelmann, but in this he must be wrong, for *Mammillaria vivipara* Haworth was based upon *Cactus viviparus* Pursh, a name previously used by Nuttall, and both Pursh's and Nuttall's descriptions were based on the specimens collected by Nuttall in "Upper Louisiana" in 1812. This is undoubtedly the plant which Engelmann had in mind and which he called variety *vera*. We have not seen the type, but Pursh stated that he had seen flowers in Lambert's Garden.

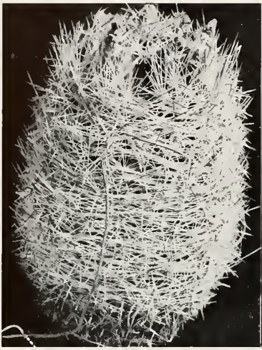


Fig. 42.—Coryphantha chlorantha.

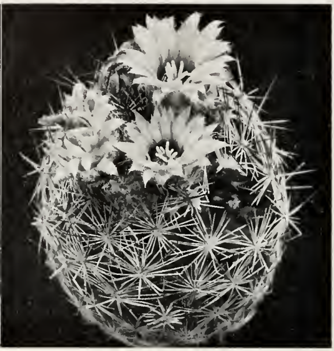


Fig. 43.—Coryphantha neo-mexicana.

Engelmann's remarks regarding the variability of the species are interesting. In the Proceedings of the American Academy (3: 269) he says:

> "The extreme forms are certainly very unlike one another, but the transitions are so gradual that I can not draw strict limits between them."

Coryphantha vivipara and the three following species are closely related.

This plant is a day bloomer, and according to Engelmann the flowers become fully expanded about one o'clock in the afternoon.

Hooker in Curtis's Botanical Magazine (pl. 7718) figures and describes a plant purchased from D. M. Andrews of Boulder, Colorado, in which all the spines are brown, the flower is rose-red, and the stigma-lobes are linear and white.

Mammillaria montana is described briefly and figured (f. 1399) by Blanc in Hints on Cacti, p. 72. It is also described and figured by Darel (Illustr. Handb. Kakteen 96. f. 81), who says that it comes from Montana and Utah. It is illustrated by Haage (Cact. Kultur ed. 2. 187). It is apparently the same as *Coryphantha vivipara.*

Illustrations: Cycl. Amer. Hort. Bailey **2:** f. 1356; Stand. Cycl. Hort. Bailey **4:** f. 2315; Tribune Hort. **4:** pl. 140; Curtis's Bot. Mag. **126:** pl. 7718; De Laet, Cat. Gén. f. 43; Cact. Mex. Bound. pl. 74, f. 3 (seed); Meehan's Monthly **9:** pl. 9, as *Mammillaria vivipara;* Clements, Rocky Mountain Flow. pl. 32, f. 7; Clements, Fl. Mount. Plain pl. 32, f. 7; Britton and Brown, Illustr. Fl. **2:** 462. f. 2526, as *Cactus viviparus;* Monatsschr. Kakteenk. **3:** 132; Schelle, Handb. Kakteenk. 236. f. 150; Floralia **42:** 375, as *Mammillaria radiosa;* Cact. Mex. Bound. pl. 74, f. 5 (seed), as *Mammillaria radiosa texana;* Cact. Mex. Bound. pl. 74. f. 4 (seed), as *M. radiosa borealis;* Britton and Brown, Illustr. Fl. ed. 2. **2:** f. 2985.

32. Coryphantha neo-mexicana (Engelmann).

Mammillaria vivipara radiosa neo-mexicana Engelmann, Proc. Amer. Acad. *3:* 269. 1856.
Mammillaria radiosa neo-mexicana Engelmann, Cact. Mex. Bound. 64. 1859.
Mammillaria radiosa borealis Engelmann, Cact. Mex. Bound. 68. 1859.
Mammillaria radiosa texana Engelmann, Cact. Mex. Bound. 68. 1859.
Cactus radiosus neo-mexicanus Coulter, Contr. U. S. Nat. Herb. *3:* 120. 1894.
Cactus neo-mexicanus Small, Fl. Southeast. U. S. 812. 1903.
Mammillaria neo-mexicana A. Nelson in Coulter and Nelson, Man. Bot. Rocky Mountains 327. 1909.

Plants usually solitary, globular to short-oblong, 8 to 12 cm. long, the whole body usually hidden under a mass of spines; radial spines numerous, acicular, usually white; central spines several, much stouter than the radials, pale below, brown or black towards top; flowers 4 to 5 cm. broad when fully expanded; outer perianth-segments greenish or the ones nearer center purplish, ciliate; inner perianth-segments broadly linear, acuminate and apiculate, more or less serrate above; filaments greenish, much shorter than perianth-segments; stigma-lobes extending beyond filaments, white, obtuse, not apiculate as in *Coryphantha vivipara:* fruit 2.5 cm. long, green, juicy, naked except a few hairy scales near top, capped by withered perianth, depressed at apex.

Type locality: Western Texas to New Mexico, doubtless at El Paso.

Distribution: Western Texas, New Mexico, and northern Chihuahua.

The distribution of this species can not be stated at present very definitely. It may be that some of the plants from northern New Mexico, especially those found in the mountains, may better be referred to *C. vivipara,* and the same is true of some of the plants from Texas. It is probable that the plants from central Texas and perhaps northwestern Texas may all be referred to *C. vivipara.* We have no Mexican plants before us but we have plants from El Paso, just over the Mexican Boundary line. Just how far south the species extends we do not know. We have greatly restricted the range from that given by Coulter in the Contributions from the U. S. National Herbarium (**3:** 120. 1894).

Illlustrations: Gartenwelt **4:** 159; Cact. Mex. Bound. pl. 13; Förster, Handb. Cact. ed. 2. 304. f. 30, as *Mammillaria radiosa neo-mexicana;* Watson, Cact. Cult. 181. f. 73; ed. 3. f. 50; Dict. Gard. Nicholson **4:** 566. f. 41, as *Mammillaria vivipara radiosa;* Dict. Gard Nicholson Suppl. 517. f. 554, as *Mammillaria radiosa*; Cact. Mex. Bound. pl. 74 (seed), as *Mammillaria borealis.*

Plate II, figure 1, shows a plant sent from Canutillo, Texas, by Mrs. S. L. Pattison in 1920; figure 1*a* shows the fruit. Figure 43 is from a photograph of a plant collected by Dr. Rose near Albuquerque, New Mexico, in 1908.

33. Coryphantha arizonica (Engelmann).

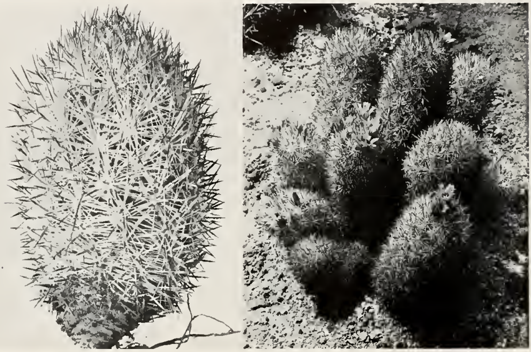
Mammillaria arizonica Engelmann, Bot. Calif. *1:* 124. 1876.
Cactus radiosus arizonicus Coulter, Contr. U. S. Nat. Herb. *3:* 121. 1894.
Mammillaria radiosa arizonica Schumann, Gesamtb. Kakteen 481. 1898.

Sometimes cespitose, forming large clumps a meter broad; each head globose to ovoid, 7.5 to 10 cm. in diameter; tubercles about 2.5 cm. long, cylindric, ascending, deeply grooved; spines numerous, straight, rigid; radial spines 15 to 20, 10 to 30 mm. long, whitish; inner spines 3 to 6, stouter than the radial ones, deep brown above; flowers large, 5 to 7 cm. broad, rose-colored; outer perianth-segments 30 to 40, linear-subulate, with fimbriate margin; inner perianth-segments 40 to 50, lanceolate-linear, attenuate; stigma-lobes 8 to 10, white; fruit oval, green; seeds compressed, light brown, pitted.

Type locality: Northern Arizona.

Distribution: Northern Arizona, especially along the Upper River of the Grand Canyon, and perhaps also in southern Utah.*

Mammillaria arizonica Engelmann, when first described, was a complex. Engelman states that it was found "on rocky and sandy soil in northern Arizona from the Colorado eastward (Coues, Palmer, F. Bischoff) and into southern Utah (J. E. Johnson); probably in southeastern California." Engelmann afterwards described Johnson's plant from Utah as *M. chlorantha* and the California plant is doubtless his *M. deserti.* We have in the U. S. National Herbarium Palmer's specimen from Arizona but we have not seen the plant of Coues nor of Bischoff.



Figs. 44 and 45.—Coryphantha deserti.

The northern range of this species is very uncertain. Engelmann extended it into southern Utah.

Plate v, figure 5, shows a plant sent by M. A. H. Spencer from the Grand Canyon, Arizona, in May 1907, which afterwards flowered in Washington.

34. Coryphantha deserti (Engelmann).

Mammillaria deserti Engelmann, Bot. Calif. *2:* 449. 1880.
Cactus radiosus deserti Coulter, Contr. U. S. Nat. Herb. *3:* 121. 1894.
Cactus radiosus alversonii Coulter, Contr. U. S. Nat. Herb. *3:* 122. 1894.
Mammillaria alversonii Zeissold, Monatsschr. Kakteenk. *5:* 70. 1895.
Mammillaria radiosa alversoni Schumann, Gesamtb. Kakteen 481. 1898.
Mammillaria radiosa deserti Schumann, Gesamtb. Kakteen 481. 1898.

Solitary or cespitose, usually cylindric, sometimes 2 dm. high, 6 to 9 cm. in diameter, densely covered with spines; radial spines white except at tip, spreading;

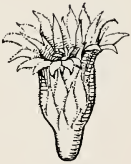


Fig. 46.—Flower of C. deserti.

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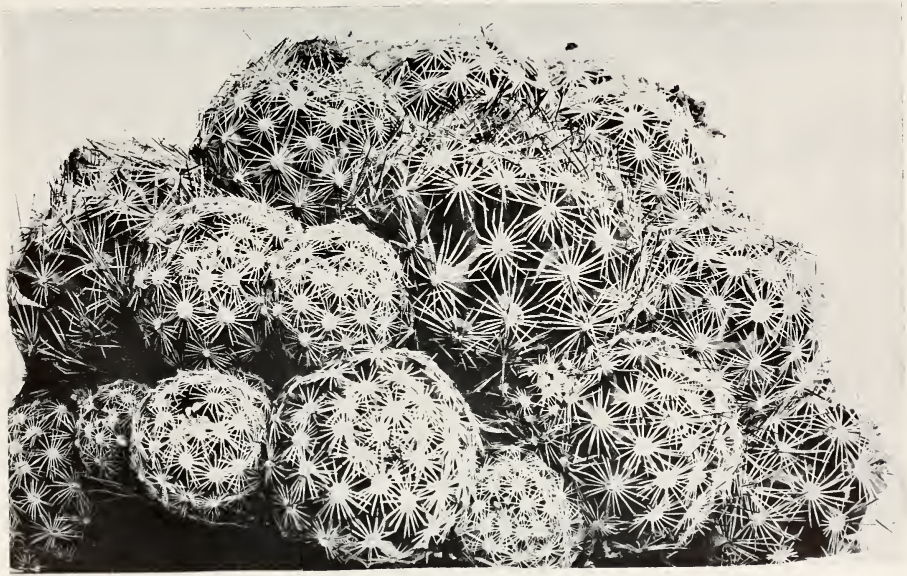
* Our Utah reference is based on some detached flowers collected by M. E. Jones and a barren plant sent by Dr. C. D. Marsh in 1922. Both collections came from above Salina.



Coryphantha aggregata, from Arizona.

central spines several, sometimes as many as 14, much stouter than the radials, slightly spreading, those toward top of plant connivent, black or bluish black in their upper half, shading into red, nearly white at base; flowers 3 cm. long and nearly as broad when expanded, light pink, opening in bright sunlight; scales and outer perianth-segments ciliate; inner perianth-segments narrow, acute.

Type locality: Ivanpah, California.

Distribution: Deserts of southern California and southern Nevada.

This species is characterized by its stiff spines, with bluish-black tips shading into red, and is known in southern California as fox-tail cactus. The original description of *Mammillaria deserti* states that the flowers are straw-colored, tipped with pink, and this suggests *Coryphanthat chlorantha* but we believe that it belongs with *Mammillaria alversonii,* which certainly has pinkish flowers, and since the name *deserti* is older than *alversonii* it is substituted for it.

Illustrations: Cact. Journ. **1:** pl. for February, in part; Alverson's Cat. pl. facing 8, as *Mammillaria alversonii;* Schumann, Gesamtb. Kakteen 480. f. 79, as *M. radiosa alversonii.*

Figure 44 is from a photograph of a single plant sent by E. C. Rost; figure 45 is from a photograph of a clump photographed by E. C. Rost in its natural surroundings; figure 46 shows a flower taken from Mr. Rost's plant.

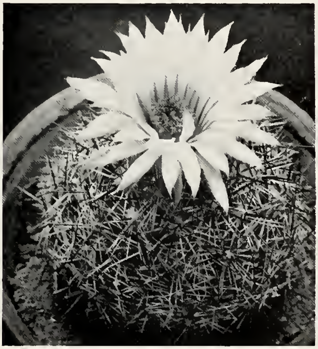


Fig. 47.—Coryphantha aggregata.

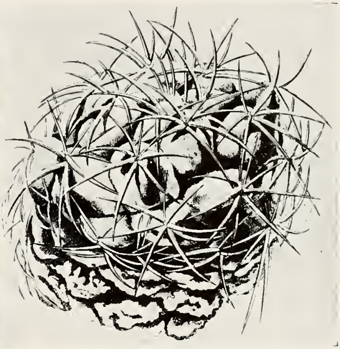


Fig. 48.—Mammillaria recurvispina.

35. Coryphantha aggregata (Engelmann).

Mammillaria aggregata Engelmann in Emory, Mil. Reconn. 157. 1848.
Cereus aggregatus Coulter, Contr. U. S. Nat. Herb. *3:* 396. 1896, as to name.
Echinocereus aggregatus Rydberg, Bull. Torr. Club *33:* 146. 1906, as to name.

Plants solitary or cespitose, globular to short-oblong, very spiny; radial spines numerous, stouter than those of *Coryphantha vivipara,* white, often with brown tips, appressed; central spines several, stout, all erect and appressed or one often porrect, those towards top of plant connivent; flowers very large and showy, purplish, 5 to 7 cm. broad; outer perianth-segments ciliate; inner perianth-segments narrowly oblanceolate, often 6 mm. broad, acute, apiculate; stigma-lobes 8 to 10, elongated, white; fruit green, oblong, 2 to 2.5 cm. long, naked or occasionally bearing a small scale on the side, juicy; seeds dark brown, 2 mm. long.

Type locality: Head waters of the Gila.

Distribution: Western New Mexico, southeastern Arizona, and northern Sonora.

Mammillaria aggregata came from the headwaters of the Gila. The type was not preserved and is known only from a drawing reproduced in Emory's report. There has been much discussion about the identity of the plant; Coulter transferred it to *Cereus,* referring to it *Cereus coccineus* and *C. phoeniceus* and assigning to it a wide range, Colorado to San Luis Potosí. Rydberg transferred the name to *Echinocereus* but applied it to the same group of plants described by Coulter. A careful restudy of the original illustration and Engelmann's description and a restudy of all the cacti of similar habit in the southwest leads us to a different conclusion from that reached by Dr. Coulter and Dr. Rydberg. Engelmann, who described it as a *Mammillaria,* says that it appears to be allied to *M. vivipara,* and this we belive is its true relationship. A *Mammillaria* from the region about Flagstaff often forms the great clusters mentioned by Engelmann, and while we believe that it differs from the one found in northern Arizona it is certainly a near ally, probably representing the closely related species from southeastern Arizona and southwestern New Mexico which has often passed as *M. arizonica.*

Engelmann referred a specimen which he had from Sonora to his variety *Mammillaria vivipara neo-mexicana* with the remark that it was "a form with more spines than any other."

Plate IV shows a clump sent by Mrs. Ruth C. Ross from near Aravaipa, Arizona, in July 1922. Figure 47 is from a photograph of a single plant obtained by Dr. Rose near Benson May 1, 1908, which afterwards flowered in Washington.

36. Coryphantha cubensis Britton and Rose, Torreya 12: 15. 1912.

Mammillaria urbaniana Vaupel, Monatsschr. Kakteenk. *22:* 65. 1912.

Plants depressed-globose, tufted, 2 to 3 cm. broad, pale green; tubercles numerous, vertically compressed, 6 to 7 mm. long, 4 to 5 mm. wide, about 3 mm. thick, grooved on upper side from apex to below middle, the groove very distinct; spines about 10, whitish, radiating, acicular but weak, 3 to 4 mm. long, those of young tubercles subtended by a tuft of silvery white hairs, 1.5 mm. long; flowers pale yellowish green, 16 mm. high, the segments acute; filaments, style, and stigma-lobes yellowish; fruit red, less than 1 cm. long, naked; seeds black, somewhat angled.

Type locality: Among stones in barren savanna, southeast of Holguin, Oriente, Cuba.

Distribution: Type locality and vicinity.

This species is very inconspicuous and perhaps for that reason is rare in collections. It has only twice, to our knowledge, been collected, both times by Dr. J. A. Shafer, once in 1909 (No. 2946)and again in 1912 (No. 12432), who gave a short account of its discovery in the Journal of the New York Botanical Garden (No. 155). He states that it barely protrudes through the layer of broken stones that filled the interstices between the larger rocks; that the largest plants were scarcely an inch in diameter, one of them bearing a small yellowish flower. It lives only a short time in greenhouse cultivation.

On account of the name *Mammillaria cubensis* Zuccarini (Labouret, Monogr. Cact. 59. 1853) Vaupel gave a new specific name to the plant when he transferred it from *Croyphantha.*

Plate V, figure 1, shows the plant collected by Dr. Shafer in 1912 which flowered in the New York Botanical Garden in July of the same year; figure 1*a* shows the fruit and figure 1*b* shows a tubercle from the same plant.

37. Coryphantha sulcata (Engelmann).

Mammillaria sulcata * Engelmann, Bost. Journ. Nat. Hist. *5:* 246. 1845.
Mammillaria strobiliformis Mühlenpfordt, Allg. Gartenz. *16:* 19. 1848. Not Engelmann, 1848.
Mammillaria calcarata Engelmann, Bost. Journ. Nat. Hist. *6:* 195. 1850.
Coryphantha calcarata Lemaire, Cactées 35. 1868.
Cactus calcaratus Kuntze, Rev. Gen. Pl. *1:* 259. 1891.
Cactus scolymoides sulcatus Coulter, Contr. U. S. Nat. Herb. *3:* 116. 1894.
Mammillaria radians sulcata Schumann, Gesamtb. Kakteen 496. 1898.
Cactus sulcatus Small, Fl. Southeast. U. S. 812. 1903.

Cespitose, 8 to 12 cm. in diameter; tubercles rather large, 10 to 12 mm. long, somewhat flattened, soft; radial spines acicular, straight, white; central spines several, one somewhat stouter

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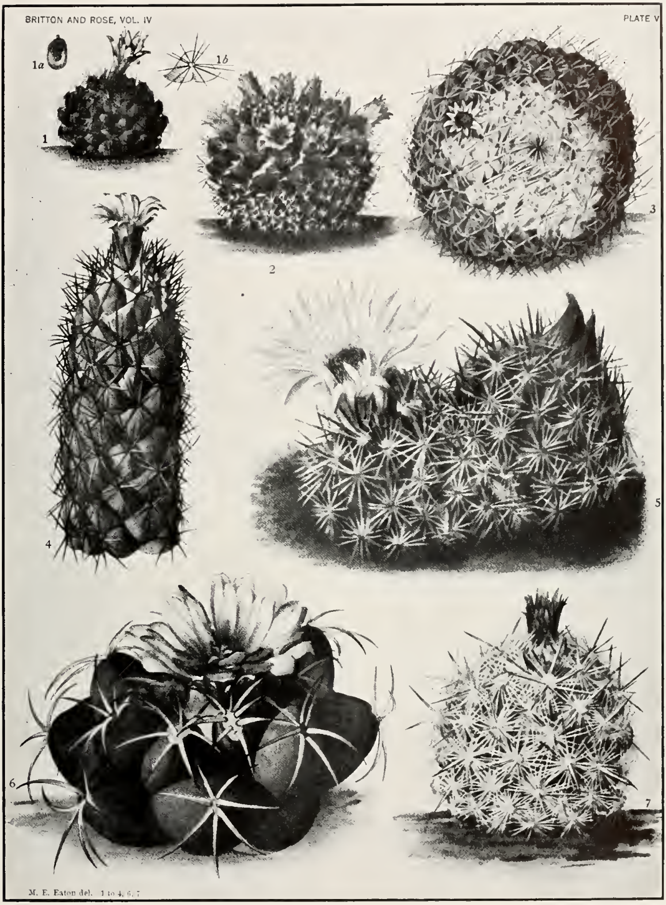
* Förster (Handb. Cact. 255. 1846) credits such a name to Pfeiffer but it is without description.


BRITTON AND ROSE, VOL. IV
PLATE V
1a
1b
1
2
3
4
5
6
7

M. E. Eaton del. 1 to 4, 6, 7

1. Flowering plant of *Coryphantha cubensis*.
1*a*. Fruit of same.
1*b*. Tubercle of same.
2. Flowering plant of *Neomammillaria confusa*.
3. Flowering plant of *Neomammillaria geminispina*.
4. Top of flowering plant of *Coryphantha durangensis*.
5. Flowering plant of *Coryphantha arizonica*.
6. Flowering plant of *Coryphantha bumamma*.
7. Flowering plant of *Coryphantha chlorantha*.

(All three-fourths size.)

than the others, porrect or slightly curved outward, others erect; flowers several, from near center of plant, 5 cm. in diameter or more, yellow, with a red center; inner perianth-segments lanceolate, apiculate; filaments reddish; style greenish yellow, exserted beyond stamens; stigma-lobes 7 to 10, yellow, notched at apex;* fruit oblong, greenish; seeds oblong, shining, dark brown.

Type locality: Industry, Texas.

Distribution: Southern Texas.

The herbarium sheets of this plant, sent us from the Missouri Botanical Garden, contain seeds, fruit, and style. Dr. Coulter speaks of seeing the spines of the type.

The name *Mammillaria sulcata,* first given by Engelmann, was changed by him to *M. calcarata* on account of *M. sulcata* Pfeiffer, but this was a later name and hence can not replace Engelmann's first one.

This species was collected by Lindheimer at Industry, Texas, growing with *Mammillaria similis,* but while the two are similar in habit, this plant differs from *M. similis* in having green fruit and brown oblong seeds instead of red fruit and black globose seeds, as well as in other ways. It has not been collected much in recent years and its characters and range have been involved with other species. Miss Ellen D. Schulz sent us plants from San Antonio, Texas, in June 1921, and Robert Runyon sent us plants and photographs in 1922, which have enabled us to restudy the species in connection with its type now kept in the Engelmann Herbarium in the Missouri Botanical Garden.

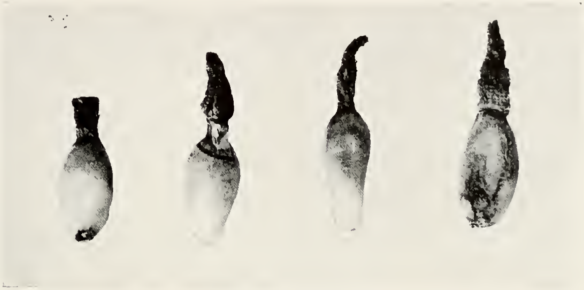


FIG. 49.—Coryphantha sulcata.

Mammillaria goerngii was given by Haage (Cact. Kultur ed. 2. 183. 1900) as a new name for *M. calcarata.*

Illustrations: Cact. Mex. Bound. pl. 74. f. 1, as *Mammillaria calcarata;* Monatsschr. Kakteenk. 27: 65, as *Mammillaria radians sulcata.*

Plate x, figure 1, shows a plant photographed by Robert Runyon at Sabinal, Texas, April 28, 1922. Figure 49 is from a photograph of four fruits sent by Professor Albert Ruth, of Polytechnic, Texas, in 1922.

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*Whether this is a constant character we do not know, but we have observed it in three flowers, all from the same plant. It has not been noted before in any other species of *Coryphantha.*

PUBLISHED SPECIES, PERHAPS OF THIS GENUS.

Mammillaria calochlora Hortus, Monatsschr. Kakteenk. 26: 167. 1916; 2 : 133. 1917.

This seems undoubtedly a species of *Coryphantha*, but we have not been able to identify it. There is considerable confusion regarding this plant, as the following note from Meyer would indicate:

> "I have gotten Mr. Quehl to send me the flower of *Mammillaria calochlora* Hort. and I see that this also agrees exactly with the flower of Grässner's *M. delaetiana*. As third and last I have now gotten Mr. de Laet to send me also a little plant of equal size of his genuine *M. delaetiana* Quehl and this one is entirely different from the two others in form and color of the body, areoles, and spines."

We have a small specimen and a photograph sent us by L. Quehl in 1921.

Mammillaria cordigera Heese, Gartenflora **59:** 445. 1910.

Short-cylindric, 6 cm. high, 4.5 cm. in diameter; tubercles 4-angled, broader than long, grooved above; spine-areoles longer than broad; radial spines 4 to 15, white, spreading; central spines 4, erect, curved if not hooked at apex, 15 mm. long; flowers and fruit unknown.

Type locality: Not cited.

Distribution: Doubtless Mexico.

This species we know only from descriptions and illustration. The illustration is so much like that of *Mammillaria bombycina* that we at first were inclined to combine them. From the observations of others there seem to be important technical differences which separate them, not only specifically but also generically. It may prove to be a synonym of *C. sulcolanata*, for we have recently examined a skeleton sent us by Bödeker which resembles very much the plants collected by Rose in Hidalgo, Mexico, which we have already referred to that species.

Illustration: Gartenflora **59:** f. 50, as *Mammillaria cordigera*.

Mammillaria cornuta Hildmann in Schumann, Gesamtb. Kakteen 496. 1898.

Simple, grayish green, somewhat depressed, 4 to 5 cm. high, 6 to 8 cm. in diameter; tubercles spiraled, in 5 to 8 series; radial spines 5 to 7, subulate, straight or somewhat curved, white, 4 to 8 mm. long; central spine solitary, horn-colored; flowers said to be rose-colored; fruit unknown.

Type locality: Mexico.

From the description it is difficult to identify this species; its rose-colored flowers suggest a relationship with *Coryphantha elephantidens* but its spine-clusters are differently described.

Mammillaria potosiana Jacobi, Allg. Gartenz. **24:** 92. 1856.

Erect, cylindric, light green; tubercles conical, triangular at base, bearing 2 yellow glands in their axils; radial spines 15 or 16, subulate, equal or nearly so, 6 mm. long; central spine solitary, porrect but somewhat incurved at apex, subulate, 10 to 12 mm. long; flowers yellow.

Type locality: San Luis Potosí, Mexico.

Jacobi comments on the species as follows:

> "Comptroller Shäfer in Münster received this beautiful plant in a shipment of plants from San Luis Potosí in Mexico, under the name of *Mammillaria raphidacantha*. From the given description it is adequately clear that the plant considered is another and undescribed one. The form of the tubercles as well as the number and form of the spines is other evidence, also the grooves upon the upper sides of the tubercles which are always present in the case of *M. raphidacantha* are here lacking throughout.
>
> "The stem of the plant is cylindrical, dark green, finely punctuate with white dots; tubercles conical, 3-angled at the base, gradually flattened above; axils sinuate with 2 yellow glands, inclosed by a ring of yellowish-white tomentum; areoles terminal, oval, the younger ones whitish tomentose, later naked; radial spines 15 or 16, radiating, somewhat recurved, needle-formed, two-colored. In older plants there appears here and there a longer and stronger central spine with the tip slightly bent downward. All the spines are awl-shaped and stiff.

"The radial spines when young are white with brownish (burnt) tips, later amber-colored above and below, grayish in the middle. The plant described is 3″ high and a little more than an inch in diameter; radials 3, centrals 5 or 6 lines long. The plant in my possession did indeed bloom last summer but I was hindered unfortunately in describing the flowers in detail. They are smaller than those of *M. raphidacantha,* very similar in form, but the petals are yellow with saffron-yellow central stripes on the outer side."

Although Jacobi states definitely that the tubercles are not grooved on the upper surface, yet the presence of glands would indicate that the plant is not a *Mammillaria* but, more likely, a *Coryphantha* of the Series *Recurvatae* and perhaps one of the species already described. We have never seen glands in the axils of tubercles, except in genera having grooved tubercles. In cultivated specimens growing under abnormal conditions tubercles are sometimes produced without a groove and with glands in their axils.

MAMMILLARIA RAMOSISSIMA Quehl, Monatsschr. Kakteenk. **18**: 127. 1908.

Globose to short-cylindric, dull grayish green; radial spines about 12, about 1 cm. long; central spines usually 1, sometimes 2 or 3; flowers and fruit unknown.

Type locality: Not cited.

Illustrations: Monatsschr. Kakteenk. **18**: 127.

MAMMILLARIA RECURVISPINA De Vriese, Tijdschr. Nat. Geschr. **6**: 53. 1839.

Cactus recurvispinus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Solitary, somewhat depressed, about 16 cm. in diameter, glaucous; tubercles few, large, somewhat compressed, obtuse; areoles and axils of tubercles described as naked; spines all radial, 8, subulate, more or less incurved; flowers and fruit unknown.

Type locality: Mexico.

This plant was referred by Labouret to *Mammillaria sulcolanata* but was discussed by Schumann under *M. scheeri;* judging from the illustration, it is not close to either of these species but it is much nearer *Coryphantha bumamma.*

Illustration: Tijdschr. Nat. Geschr. **6**: pl. 1. f. 1.

Figure 48 is a reproduction of the illustration cited above.

Mammillaria speciosa De Vriese (Tijdschr. Nat. Geschr. **6**: 52. 1839. Not Don, 1830) is listed by Schumann among the species not known to him. It probably belongs to some species of *Coryphantha.*

The following names are without descriptions and can not be referred to any known species: *Coryphantha conspicua* Lemaire, Cactées 34. 1868; *Coryphantha engelmannii* Lemaire, Cactées 34. 1868; *Coryphantha hookeri* Lemaire, Cactées 34. 1868; *Coryphantha sublanata* Lemaire, Cactées 35. 1868.

7. NEOBESSEYA gen. nov.

Simple or tufted cacti, globose or somewhat depressed; tubercles irregular or somewhat spiraled, most of them grooved on upper side; flowers borne near top of plant, large, yellow or pink, probably always day-blooming; fruit globose, bright red, indehiscent; seeds black, globose, pitted, with a prominent white aril.

Type species: *Mammillaria missouriensis* Sweet.

Four species are recognized, all from the Great Plains of the United States.

The generic name commemorates Dr. Charles Edwin Bessey 1845-1915), professor in the University of Nebraska and for many years one of our eminent botanical teachers.

The genus is nearest *Coryphantha,* but it has very different fruit and seeds.

KEY TO SPECIES.

Flowers yellow.	
Outer perianth-segments naked	1. *N. wissmannii*
Outer perianth-segments ciliate.	
Inner perianth-segments long-acuminate	2. *N. similis*
Inner perianth-segments at most acute	3. *N. missouriensis*
Flowers grayish pink	4. *N. notesteinii*

1. Neobesseya wissmannii (Hildmann).

Mammillaria similis robustior Engelmann, Bost. Journ. Nat. Hist. *6:* 200. 1850.
Mammillaria nuttallii robustior Engelmann, Proc. Amer. Acad. *3:* 265. 1856.
Mammillaria missouriensis robustior S. Watson, Bibl. Index *1:* 403. 1878.
Cactus missouriensis robustior Coulter, Contr. U. S. Nat. Herb. *3:* 111. 1894.
Mammillaria wissmannii Hildmann in Schumann, Gesamtb. Kakteen 498. 1898.
Cactus robustior Small, Fl. Southeast. U. S. 812. 1903.

Plant solitary, or forming mounds 2 to 3 dm. in diameter and 1 dm. high with 25 heads or more; areoles elliptic when young, conspicuously white-woolly, the head usually globose, tubercles rather large, spreading, somewhat narrowed towards apex; spines 7 to 14, when young white to brownish, in age gray with yellow swollen base, acicular, 1.5 to 2 cm. long, sometimes all radial and spreading, rarely 1 or 2 centrals and these porrect; flowers large, 4 to 5 cm. long, dark yellow; scales on flower-tube strongly nerved; margin or perianth-segments naked; inner segments abruptly long-apiculate; fruit globose, 8 mm. in diameter.

Type locality: Not cited, presumably Texas.

Distribution: Central Texas.

Illustration: Blühende Kakteen **1:** pl. 5, as *Mammillaria wissmanni.*

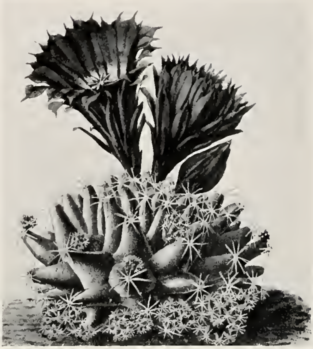


Fig. 50.—Neobesseya wissmannii.

Figure 50 is a reproduction of the illustration cited above.

2. Neobesseya similis (Engelmann).

Mammillaria similis Engelmann, Bost. Journ. Nat. Hist. *5:* 246. 1845.
Mammillaria similis caespitosa Engelmann, Bost, Journ. Nat. Hist. *6:* 200. 1850.
Echinocactus similis Poselger, Allg. Gartenz. *21:* 107. 1853.
Mammillaria nuttallii caespitosa Engelmann, Proc. Amer. Acad. *3:* 265. 1856.
Mammillaria missouriensis caespitosa S. Watson, Bibl. Index *1:* 403. 1878.
Cactus missouriensis similis Coulter, Contr. U. S. Nat. Herb. *3:* 111. 1894.
Mammillaria missouriensis similis Schumann, Gesamtb. Kakteen 498. 1898.
Cactus similis Small, Fl. Southeast. U. S. 812. 1903.
Coryphantha similis Britton and Rose in Britton and Brown, Illustr. Fl. ed. 2. *2:* 571. 1913.

Plants sometimes growing in large clumps 1 to 1.5 dm. high by 2 to 3 dm. in diameter, containing 25 individuals or more; larger plants 6 to 10 cm. in diameter; tubercles deep green, cylindric, sometimes 2 cm. long, when young the groove filled with white wool; spines all puberulent; radial spines 12 to 15, spreading, dirty white with brownish tips; central spine solitary or often wanting, similar to but stouter and longer than the radials; flowers 5 to 6 cm. long, light yellow, the outer lobes tinged with brown and green; inner perianth-segments long, narrow, acuminate; flower-tube definite, covered nearly to its base with short greenish stamens; style green; stigma-lobes 4 to 6, linear; fruit globular or short-oblong, 10 to 20 mm. in diameter; seeds large, globose, 2 mm. in diameter.

Type locality: Near Industry, Texas.

Distribution: Eastern Texas.

Engelmann says that the flowers and fruits are larger than in *Mammillaria nuttallii.* The inner perianth-segments gradually taper to the apex.

S. Watson and others refer here *Mammillaria caespitosa* Gray (Struct. Bot. 421. f. 838), but the plant illustrated by Gray is *Echinocereus reichenbachii.* The Index Kewensis refers *Mammillaria caespitosa* Gray, as they also do *Mammillaria similis,* to *Mammillaria missouriensis.* (See Cactaceae **3:** 26).

Illustration: Cact. Mex. Bound. pl. 74, f. 7, as *Mammillaria nuttallii caespitosa* (seed).

Plate III, figure 2, shows a plant collected by F. E. Upham at Fort Worth, Texas, which flowered in Washington.

3. Neobesseya missouriensis (Sweet).

Cactus mammillaris Nuttall, Gen. Pl. *1:* 295. 1818. Not Linnaeus, 1753.
Mammillaria missouriensis Sweet, Hort. Brit. 171. 1826.
Mammillaria simplex Torrey and Gray, F. N. Amer. *1:* 553. 1840.
Mammillaria nuttallii Engelmann, Pl. Fendl. 49. 1849.
Mammillaria nuttallii borealis Engelmann, Proc. Amer. Acad. *3:* 264. 1856.
Cactus missouriensis Kuntze, Rev. Gen. Pl. *1:* 259. 1891.
Mammillaria missouriensis nuttallii Schelle, Handb. Kakteenk. 241. 1907.
Coryphantha missouriensis Britton and Rose in Britton and Brown, Illustr. Fl. ed. 2. *2:* 570. 1913.

Plants solitary or cespitose, globose, 2.5 to 5 cm. in diameter; tubercles more or less spiraled, 10 to 15 mm. long; spines 10 to 20, acicular, gray, pubescent, all radial or sometimes 1 central; flowers greenish yellow; outer perianth-segments narrowly oblong, gradually tapering to an acute apex, ciliate; inner segments linear-lanceolate, attenuate; fruit globose, scarlet, about 1 cm. in diameter; seeds 1 mm. in diameter.

Type locality: On the high hills of the Missouri, probably to the mountains.

Distribution: North Dakota to Montana, Colorado to Kansas, Oklahoma, and perhaps northern Texas.

This little cactus has a wide distribution on the Great Plains; both its conspicuous yellow flowers and its round red fruits are very attractive.

Coryphantha nuttallii, credited to Engelmann, is cited as a synonym of *Mammillaria nuttallii* by Rümpler (Förster, Handb. Cact. ed. 2. 407. 1885).

Illustrations: Meehan's Monthly **10:** pl. 3; Gartenwelt **1:** 85, as *Mammillaria missouriensis;* Gartenwelt **1:** 89, as *M. missouriensis viridescens;* Britton and Brown, Illustr. Fl. **2:** f. 2525, as *Cactus missouriensis;* Schelle, Handb. Kakteenk. 241. f. 160, as *M. missouriensis nuttallii;* Cact. Mex. Bound. pl. 74, f. 6, as *M. nuttallii borealis;* Blanc, Cacti 72. No. 1426; Blühende Kakteen **3:** pl. 145, as M. *nuttallii;* Britton and Brown, Illustr. Fl. ed. 2. **2:** f. 2984, as *Coryphantha missouriensis.*

Plate XI, figure 4, shows a plant from a large clump sent by Professor C. O. Chambers in 1921 from Stillwater, Oklahoma.

4. Neobesseya notesteinii (Britton).

Mammillaria notesteinii Britton, Bull. Torr. Club *18:* 367. 1891.
Cactus notesteinii Rydberg, Mem. N. Y. Bot. Gard. *1:* 272. 1900.

Oval, solitary or cespitose, about 3 cm. in diameter; tubercles nearly terete, about 6 mm. high; spines 12 to 18, white, turning gray, weak, slender, 8 to 12 mm. long, pubescent throughout, a central one usually present and frequently pink-tipped; flowers 15 to 25 mm. broad, ash-gray, tinged and penciled with pink, the segments broadly linear-oblong, mucronate; fruit obovoid; seeds black, globose, pitted.

Type locality: Near Deer Lodge, Montana.

Distribution: Known only from the type locality.

Professor F. N. Notestein, who first collected and observed this little cactus, found it in gravelly soil near a small creek; it differs from the other species of the genus in the color of the flowers and the more pubescent spines.

8. ESCOBARIA gen. nov.

Globose or cylindric, usually cespitose cacti, never milky; tubercles grooved above; persisting as knobs at the base of old plants after the spines have fallen; spines both central and radial, never hooked; flowers small, regular, appearing from top of plant at bottom of groove of young tubercles; stamens and style included; fruit red, naked (or with one scale), indehiscent, globular to oblong, crowned by the withering perianth; seeds brown to black; aril basal or subventral, oval.

Type species: *Mammillaria tuberculosa* Engelmann.

The two species of this genus known to Schumann were placed by him in the subgenus *Coryphantha* of *Mammillaria:* they are like the *Coryphanthae* in having grooved flower-bearing tubercles, but are otherwise different, especially in the flowers, fruit, and seeds.

Eight species are known from northern Mexico and southern Texas.

The genus commemorates the work of two distinguished Mexicans, the Escobar brothers, Rómulo and Numa, of Mexico City and Juárez.

KEY TO SPECIES.

Outer perianth-segments ciliate.
Groove of tubercles without glands.
Flowers large for the genus, 2 to 2.5 cm. long.
Plants elongated; seeds very small, brown, with ventral hilum........................1. *E. tuberculosa*
Plants usually globose; seeds larger than in *E. tuberculosa*, black, with a subbasal hilum........................2. *E. dasyacantha*
Flowers small, about 1.5 cm. long.
Plants globose to stout-cylindric.
Inner perianth-segments pointed.
Inner perianth-segments broad........................3. *E. chihuahuensis*
Inner perianth-segments narrow........................4. *E. runyonii*
Inner perianth-segments obtuse........................5. *E. chaffeyi*
Plants slender-cylindric........................6. *E. sneedii*
Groove of tubercles with glands........................7. *E. bella*
Outer perianth-segments ciliate........................8. *E. lloydii*

1. Escobaria tuberculosa (Engelmann).

Mammillaria strobiliformis Scheer in Salm-Dyck, Cact. Hort. Dyck. 1849. 104. 1850. Not Engelmann, 1848.
Echinocactus strobiliformis Poselger, Allg. Gartenz. *21:* 107. 1853.
Mammillaria tuberculosa Engelmann, Proc. Amer. Acad. *3:* 268. 1856.
Cactus tuberculosus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus strobiliformis Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Mammillaria strobiliformis pubescens Quehl, Monatsschr. Kakteenk. *17:* 87. 1907.
Mammillaria strobiliformis durispina Quehl, Monatsschr. Kakteenk. *17:* 87. 1907.
Mammillaria strobiliformis rufispina Quehl, Monatsschr. Kakteenk. *17:* 87. 1907.
Mammillaria strobiliformis caespititia Quehl, Monatsschr. Kakteenk. *19:* 173. 1909.

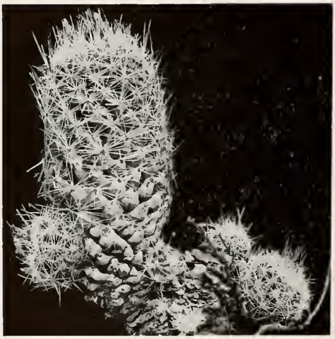


FIG. 51.—Escobaria tuberculosa.

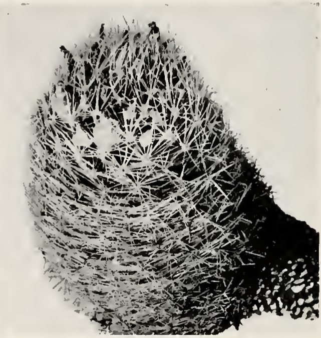


FIG. 52.—Escobaria dasyacantha.

Usually growing in clumps, cylindric or becoming so, 5 to 18 cm. high, 2 to 6 cm. in diameter; tubercles more or less regularly arranged in spirals, 6 mm. long; radial spines numerous, white, sometimes as many as 30, acicular, 4 to 15 mm. long; central spines several, stouter than radials, brown to blackish or colored only at tips, one of them usually porrect; flowers 2.5 cm. in diameter when fully expanded, light pink; outer perianth-segments acute, ciliate; inner perianth-segments narrowly pointed; fruit oblong, up to 20 mm. long, red; seeds pitted, with a small ventral hilum.

Type locality: Mountains near El Paso and eastward.

Distribution: Southwestern Texas, southern New Mexico, and adjacent Mexico.

Flowers appear in the afternoon and last for two days at least.

The name *Coryphantha tuberculosa* occurs in C. R. Orcutt's Circular to Cactus Fanciers, 1922.

Illustrations: Cact. Mex. Bound. pl. 12, f. 1 to 16, as *Mammillaria tuberculosa;* Förster, Handb. Cact. ed. 2. 417. f. 46; Schelle, Handb. Kakteenk. 235. f. 149, as *M. strobiliformis.*

Figure 51 is from a photograph of the plant sent by Dr. Shreve from near El Paso, Texas, in 1920.

2. **Escobaria dasyacantha** (Engelmann).

Mammillaria dasyacantha Engelmann, Proc. Amer. Acad. *3:* 268. 1856.
Cactus dasyacanthus Kuntze, Rev. Gen. Pl. *1:* 259. 1891.

Globose to short-oblong, usually 4 to 7 cm. in diameter but sometimes 20 cm. long; radial spines 20 or more, white, bristle-like; central spines about 9, stouter and longer than the radials, upper half usually reddish or brownish, often 2 cm. long; flowers pinkish; perianth-segments narrowly oblong, ciliate, apiculate; stigma-lobes green; fruit clavate, scarlet, 15 to 20 mm. long; seeds black, 1 mm. in diameter, slightly flattened, pitted, with a narrow white subbasal hilum.

Type locality: El Paso and eastward.

Distribution: Western Texas, southern New Mexico, and northern Chihuahua.

We have examined the type of this species which was collected by Charles Wright at El Paso in 1852.

Escobaria dasyacantha is sometimes mistaken for *Escobaria tuberculosa,* but the stems are usually globose and the seeds larger and of a different shape. Engelmann speaks of its resemblance to *Echinocactus intertextus dasyacanthus,* now *Echinomastus dasyacanthus,* but this is only superficial, for the flowers, fruit, and seeds of the two species are very different. The name *Coryphantha dasyacantha* occurs in C. R. Orcutt's Circular to Cactus Fanciers, 1922. We had never seen this plant in cultivation until it was recently sent by Mrs. S. L. Pattison from western Texas.

Illustrations: Cact. Mex. Bound. pl. 12. f. 17 to 22, as *Mammillaria dasyacantha.*

Plate VII, figure 1, shows a plant sent by Mrs. S. L. Pattison from near El Paso, Texas, in 1921 which flowered in the New York Botanical Garden. Figure 52 is from a photograph of another plant sent by Mrs. Pattison from the same region.

3. **Escobaria chihuahuensis** sp. nov.

Plants often solitary, perhaps also cespitose, globose to short cylindric, very spiny; tubercles short, usually hidden by the spines; radial spines numerous, spreading; central spines several, longer than radials, usually brown or black in upper part; flowers small, 1 to 1.5 cm. long, purple; outer perianth-segments broad, often rounded at apex with ciliate margins; inner perianth-segments pointed.

Common in the mountains near Chihuahua, where it was collected by Palmer (No. 72, type) in 1908 and by Pringle (Nos. 250, 251) in 1885.

This plant should be compared with *Mammillaria grusonii* Rünge (Gartenflora **38:** 105. f. 20. 1889). L. Quehl believed that *M. grusonii* was closely related to *M. scheeri,* but he apparently knew it only from the original illustration and description. It does not suggest any of the species of *Coryphantha* to us.

4. **Escobaria runyonii** sp. nov.

Cespitose, with numerous (sometimes 100) globose to short-oblong heads, grayish green, 3 to 5 cm. long with fibrous roots; tubercles 5 mm. long, terete in section with very narrow groove above; groove at first white-woolly, not glandular; radial spines numerous, acicular, white, 4 to 5 mm. long; central spines stouter than radials, 5 to 7, slightly spreading with brown or black tips, 6 to 8 mm. long; flowers 1.5 cm. long, pale purple; segments with a dark purple stripe down the middle and pale margins; outer perianth-segments narrow-oblong, with thin ciliate margins; inner perianth-segments narrower than the outer, with margins entire, acute; filaments purplish; style very pale; stigma-lobes 6, green; fruit scarlet, globose to short-oblong, 6 to 9 mm. long, juicy.

Collected by Robert Runyon in July 1921 and again in October of the same year near Reynosa, Mexico, about 75 miles up the Rio Grande from Brownsville, Texas, and on August 10, 1921, near Rio Grande, Starr County, Texas. The plant flowered in Washington March 13, 1922.

Plate VI, figure 1, is from a photograph of the type plant taken by Robert Runyon. Figure 53 is from a photograph taken by Robert Runyon.

5. Escobaria chaffeyi sp. nov.

Short-cylindric, 6 to 12 cm. long by 5 to 6 cm. in diameter, almost covered by the numerous white spines; tubercles rather short, light green, with a narrow groove above; radial spines numerous, spreading, bristly; central spines several, a little shorter than the radials and brown or black-tipped; flowers 15 mm. long, cream-colored or sometimes purplish; outer perianth-segments ciliate; inner perianth-segments oblong, obtuse, entire; style white; stigma-lobes very short, yellowish green; fruit crimson, 2 cm. long.

Collected by Dr. Elswood Chaffey near Cedros, Zacatecas, Mexico, in June 1910 (No. 5, type), and by F. E. Lloyd near the same locality in 1908 (No. 29).

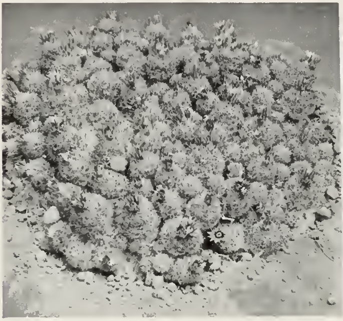


FIG. 53.—Escobaria runyonii.

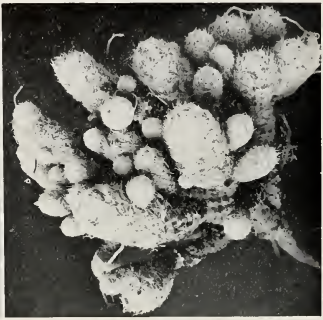


FIG. 54.—Escobaria sneedii.

6. Escobaria sneedii sp. nov.

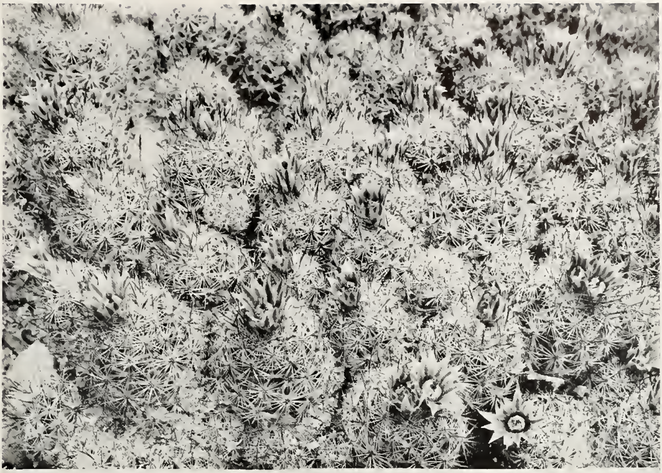
Densely cespitose, sometimes with as many as 50 joints, creeping or spreading; joints cylindric up to 6 cm. long, 1 to 2 cm. in diameter; tubercles numerous, hidden under the many spines, terete, 2 to 3 mm. long, in age naked; groove narrow, hairy throughout its length; axils of tubercles not setose; spines 20 in a cluster or more, nearly white, or the larger ones brown at tip, longest one 6 mm. long, all usually appressed, but the longer ones near top, connivent; flowers small, 10 mm. long or less when dry, the outer segments long-ciliate; fruit (immature) a little longer than thick, 5 to 7 cm. long, green (?), at first juicy, naked; seeds globose, brown, nearly 1 mm. in diameter, pitted.

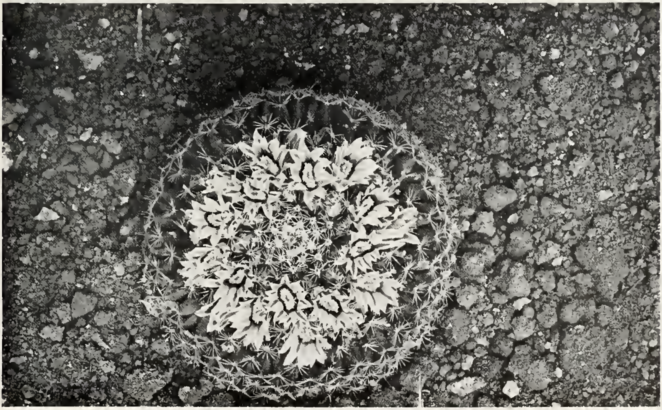
This curious little plant was sent us in February 1921 by Mrs. S. L. Pattison from southwestern Texas; it was collected by J. R. Sneed, who at first found only three clumps, but afterwards a fourth clump was discovered and again it was found in June 1921 just after it had flowered. It is known from a single station on the Franklin Mountains, Texas. According to Mrs. Slater the flowers are pink to saffron.

Figure 54 is from a photograph of a single plant sent by Mrs. Pattison in 1921.

7. Escobaria bella sp. nov.

Cespitose, cylindric, 6 to 8 cm. long; tubercles nearly terete, 1.5 to 2 cm. long, the groove white-hairy, with a narrow brownish gland near center; radial spines several, whitish, 1 cm. long or less; central spines 3 to 5, brown, unequal, the largest 2 cm. long or more, ascending; flowers central, small, rotate, nearly





Escobaria runyonii, from Texas.
Neomammillaria hemisphaerica, from Texas.

2 cm. broad; perianth-segments pinkish with pale margins, linear-oblong, acute, the outer ones ciliate; filaments reddish; upper part of style and stigma-lobes green.

Collected by J. N. Rose and Wm. R. Fitch on hills of Devil's River, Texas (No. 17991).

Plate VII, figure 4, shows the type, which flowered in the New York Botanical Garden, March 31, 1914; figure 4*a* shows a tubercle with its gland-bearing groove.

8. Escobaria lloydii sp. nov.

Plant growing in clumps and resembling a small species of *Echinocereus;* old plants bearing naked corky tubercles; radial spines about 20, spreading, slender, white; central spines several, stout, with black or with brownish tips, 2 cm. long; flowers greenish with a central stripe on outside, 2.5 cm. long; filaments, style, and stigma-lobes green; fruit red, globose to short-oblong, 6 to 12 mm. long; seeds black, pitted, globose, 1 mm. in diameter.

Collected by F. E. Lloyd in foothills of Sierra Zuluaga, Zacatecas, Mexico, March 29, 1908 (No. 5).

This species is near *Escobaria tuberculosa,* but it has much stouter central spines and greenish white, ciliate inner perianth-segments.

SPECIES PERHAPS OF THIS RELATIONSHIP.

MAMMILLIARIA EMSKOETTERIANA Quehl, Monatsschr. Kakteenk. **20:** 139. 1910.

Cespitose, globose to short-cylindric, 5 cm. high; tubercles conic, their axils naked; radial spines 20 to 25; central spines 6 to 8, setaceous, white with black tips; flowers brownish yellow, 3 cm. long.

Type locality: Not cited.

We obtained a specimen of this plant from Quehl in 1913, but it has not done well nor has it flowered and we have not been able to refer it to any described species, but believe that it may be near *Escobaria tuberculosa.* Mr. Quehl believed that it was near *Mammillaria dasyacantha,* but if it came from San Luis Potosí, as Mr. Quehl supposed, it is doubtless specifically distinct from both. The following note is a translation of some remarks by Mr. Quehl:

"Our illustration shows a grafted specimen which has naturally grown more corpulent and consequently permits one to see better its general structure and the arrangement of the spines. Ungrafted specimens are thicker, lower, and, without other characteristics, can not be distinguished from a red-spined *Mammillaria pusilla* var. *multiceps.* Only a closer inspection reveals the wart-furrows and consequently the *Coryphantha.* The similarity is so great that I suspect that the new species is already more disseminated though not correctly recognized and the plants are either set aside or ignored as a form of *Mammillaria pusilla.* The plants before me were raised by Mr. Robert Emskötter, fancy and commercial gardener, of Magdeburg, after whom I have named the species, from mixed seed which he received from San Luis Potosí, so that Mexico may be regarded as its home."

Illustration: Monatsschr. Kakteenk. **20:** 139.

9. BARTSCHELLA gen. nov.

Usually cespitose, globose to short-oblong cactus; tubercles large, somewhat united with the adjacent ones as in certain species of *Echinocactanae,* terete, not grooved, juicy, not milky; spines both radial and central, the latter usually hooked; flowers borne near top of plant, large, light purple or lavender; fruit short, hidden among the tubercles, seemingly dry, circumscissile; seeds dull black, pitted, with a narrow cylindric base, slightly constricted above; hilum large, slightly depressed, triangular.

Type species: *Mammillaria schumannii* Hildmann.

While this genus is probably to be referred to the *Coryphanthanae,* it possesses some characters of certain species of *Echinocactanae,* but the origin of the flower is quite different from any of them. The flower is large, like that of some speceis of *Coryphantha,* but the tubercles are not grooved and the seeds are not brown and reticulated. It differs from the typical species of the so-called *Mammillaria* in its large flowers and black seeds, while from all of these genera it differs in its circumscissile fruit.

This monotypic genus is named for Dr. Paul Bartsch, curator in the United States National Museum, distinguished in conchology, who has sent us cacti from many out of the way places.

1. Bartschella schumann (Hildmann).

Mammillaria schumannii Hildmann, Monatsschr. Kakteenk. *1:* 125. 1891.
Mammillaria venusta K. Brandegee, Zoe *5:* 8. 1900.

More or less cespitose (as many as 40 stems have been reported in a single cluster), 6 cm. high or less; axils slightly woolly, without bristles; radial spines 9 to 15, stout, 6 to 12 mm. long, brownish above, glabrous; central spines usually 1, sometimes 2 or 3, one of these usually hooked; in seedlings 10 or 11 radial spines developing, these spreading, feather-like with long spreading hairs; in one-year-old plants the spines simply puberulent, all white with brown tips and one central much longer than the others and strongly hooked; flower 3 to 4 cm. in diameter, the segments about 10, lanceolate, acuminate; stamens numerous, erect, shorter than the style; style slender, erect, pale; stigma-lobes 6, linear, green; fruit short, dull in color; seeds usually found in a cup between the tubercles, less than 1 mm. long.

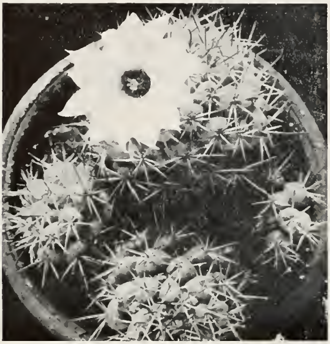


FIG. 55.—Bartschella schumannii.

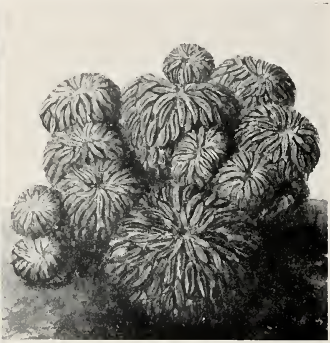


FIG. 56.—Pelecyphora aselliformis.

Type locality: Not cited.*

Distribution: Southern Lower California.

This species has been rare in collections, but considerable material was collected by Dr. Rose at Cape San Lucas, Lower California, in March 1911 (No. 16375). Living specimens were sent us from Lower California by Ivan M. Johnston in 1921.

Dr. C. H. Thompson writes under date of September 15, 1911, as follows:

> "Your No. 16375, *Mammillaria venusta,* puzzles me. We received three plants from the New York Botanical Garden. Two are considerably shriveled but are reviving. The third is more plump and shows the vegetation characters better. In these it would readily be taken for *Mammillaria,* yet there are some appearances of the mamillate *Echinocacti.* You will observe how commonly adjacent tubercles cohere as in that group of *Echinocactus,* quite distinct from any *Mammillaria* that I know. Yet the position of the flower excludes it from *Echinocactus.* With flower and fruit characters you have observed it strikes me as being distinct from either genus."

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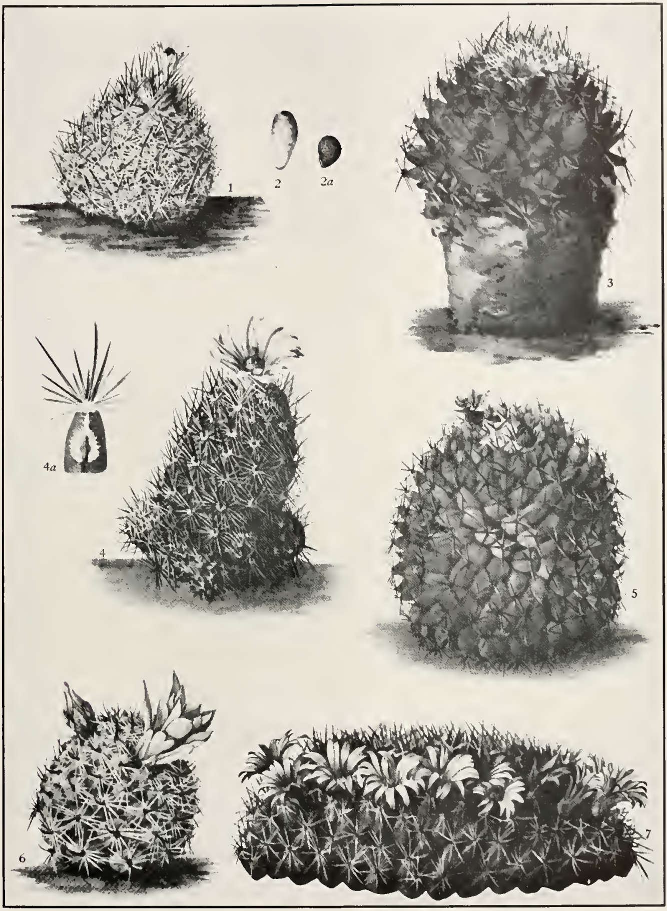
* *Mammillaria schumannii* was described from a cultivated plant, but *M. venusta* came from San José del Cabo, Lower California.



1. Flowering plant of *Escobaria dasyacantha*.
2. Fruit of *Dolichothele sphaerica*.
2*a*. Seed of same.
3. Flowering plant of *Neomammillaria arida*.
4. Flowering plant of *Escobaria bella*.
4*a*. Tubercle of same.
5. Flowering plant of *Neomammillaria crocidata*.
6. Flowering plant of *Bartschella schumannii*.
7. Flowering plant of *Neomammillaria carnea*.
(All three-fourths size.)

Mammillaria schumanniana (Monatsschr. Kakteenk. 12: 178. 1902) was evidently intended for *M. schumannii.*

Illustrations: Monatsschr. Kakteenk. 1: facing 89; Thomas, Zimmerkultur Kakteen 51, as *Mammillaria schumannii.*

Plate VII, figure 6, shows a plant collected by Dr. Rose at Cape San Lucas, Lower California, in March 1911 (No. 16375), while a member of the scientific staff of the U. S. Steamer *Albatross.* Figure 55 is from a photograph of another plant from the same collection.

10. PELECYPHORA Ehrenberg, Bot. Zeit. 1: 737. 1843.

Plants small, cespitose, cylindric or globose, tuberculate, watery; tubercles not arranged on ribs; strongly flattened, crowned with an elliptic areole bearing a pectinate spine, never grooved; flowers borne near center, broad, campanulate, purplish, the segments in definite series; flower-tube very short, slender; stamens short; fruit small, naked; seeds black, smooth.

Only one species, native of Mexico, is here recognized, *Pelecyphora aselliformis* Ehrenberg, the type. A second species has generally been referred here but it differs so widely from the other that we have no hesitancy in segregating it generically (see genus No. 13, p. 64).

The generic name is from the Greek, meaning hatchet, and from the Greek, meaning bearing, referring to the shape of the tubercles.

The plant has usually been regarded as a near relative of *Mammillaria,* but it has little in common with that genus. The flowers are central, borne in a mass of wool or hairs; the tubercles are not grooved and the seeds are black and smooth. It has been difficult for us, with the material at hand, to make out definitely the origin and position of the flower, but it seems to originate on the central sunken disk. This disk at first bears only clusters of hairs in the center of which the flower is produced. In time the flower opens and the tubercle, with its peculiar spiny crown, is developed, leaving in its axil the tuft of hairs about the flower.

1. **Pelecyphora aselliformis** Ehrenberg, Bot. Zeit. 1: 737. 1843.

Pelecyphora aselliformis concolor Hooker in Curtis's Bot. Mag. *99:* pl. 6061. 1873.
Pelecyphora aselliformis grandiflora Haage jr., Cact. Kultur ed. 2. 206. 1900.

Tufted, cylindric, 5 to 10 cm. high, 2.5 to 5 cm. in diameter, covered with tubercles arranged in spirals; tubercles strongly flattened laterally, somewhat stalked at base; areoles at top of tubercles very long and narrow, crowned by an elongated, scale-like spine with numerous lateral ridges, usually free at tip, giving a peculiar pectinate appearance; flowers 3 cm. broad or more, campanulate; perianth-segments in 4 rows, the outer ones sometimes white, oblong, acute; stamens borne at top of flower-tube, much shorter than perianth-segments; stigma-lobes 4, erect; seeds 1 mm. broad, kidney-shaped.

Type locality: Mexico.

Distribution: About San Luis Potosí, Mexico.

This plant does not do well in cultivation. It is known generally as the hatchet cactus, and is also called peote and peyote, also peyotillo and peotillo; it is said by the Mexicans to possess medicinal properties.

Mammillaria aselliformis, according to Watson (Cact. Cult. 188. 1889), was described in 1843, but we have found no other reference to it, except that Dr. A. Weber gives it as a synonym, crediting it to Monville. The name *Anhalonium aselliforme* Weber and *Ariocarpus aselliformis* Weber (Dict. Hort. Bois 931. 1898), quoted by Schumann as synonyms, were not formally published. *Pelecyphora fimbriata* Hildmann (Monatsschr. Kakteenk. 3: 68. 1893), simply a name, may or may not belong here.

Illustrations: Haage, Cact. Kultur ed. 2. 206, as *Pelecyphora aselliformis grandiflora;* Amer. Gard. 11: 474; Curtis's Bot. Mag. 99: pl. 6061, as *Pelecyphora aselliformis concolor;* Rümpler, Sukkulenten 208. f. 118; Gartenflora **34:** 25; Watson, Cact. Cult. 189. f. 75; ed. 3. f. 52; Cycl. Amer. Hort. Bailey **1:** 203. f. 303; Stand. Cycl. Hort Bailey **2:** f. 718; Illustr. Hort. **5:** pl. 186; Förster, Handb. Cact. ed. 2. 237. f. 21; Cact. Journ. **1:** 107, 149; Krook, Handb. Cact. 34; Ann. Rep. Smiths. Inst. **1908:** pl. 14, f. 6; Palmer, Cult. Cact. 117; Schelle, Handb. Kakteenk. 275. f. 197; Monatsschr. Kakteenk. **29:** 81; Weinberg, Cacti 23; Knippel, Kakteen pl. 28; Möllers Deutsche Gärt. Zeit. **25:** 477. f. 11, No. 3; Garten-Zeitung **4:** 218. f. 50; Blanc. Cacti 78. No. 1710; West Amer. Sci. **11:** 8; Balt. Cact. Journ. **1:** 89; **2:** 164; Floralia **42:** 369; Remark, Kakteenfreund 22; Haage, Cact. Kultur ed. 2. 206.

Figure 56 is reproduced from a painting made by Miss E. I. Schutt in 1907, of a plant sent from San Luis Potosí in 1905 by Dr. E. Palmer.

11. PHELLOSPERMA gen. nov.

A globular to cylindric, usually cespitose cactus with a large, fleshy, branched root; tubercles not grooved above, not milky; flowers borne in axils of old tubercles, funnel-shaped; fruit globular to cylindric, red, depressed at apex; seeds large (for this group), dull black, not pitted but rugose, with a thick corky base nearly as large as the body.

Type species: *Mammillaria tetrancistra* Engelmann.

This genus differs from all its relatives in its very peculiar seeds. The flower, in its shape and origin, suggests the following genus, but in its color and size resembles *Coryphantha radiosa*. A single species is known, native of the western United States.

The generic name is from the Greek, meaning cork, and from the Greek, meaning seed, referring to the corky base of the seed.

1. Phellosperma tetrancistra (Engelmann).

Mammillaria tetrancistra Engelmann, Amer. Journ. Sci. II. *14:* 337. 1852.
Mammillaria phellosperma Engelmann, Proc. Amer. Acad. *3:* 262. 1856.
Cactus phellospermus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus tetrancistrus Coulter, Contr. U. S. Nat. Herb. *3:* 104. 1894.

Solitary or cespitose, cylindric; sometimes becoming very large and then 3 dm. long, usually very spiny; root elongated, carrot-shaped or sometimes branched; tubercles terete, often elongated, their axils naked; radial spines numerous, acicular, white or sometimes with a brown tip, not pungent; central spines 1 to 4, stouter and longer than the radials, often brown or black, one or all strongly hooked; flower 3.5 to 4 cm. long, purple; base of tube slender, greenish, naked; scales and outer perianth-segments ciliate; style and stigma-lobes cream-colored; fruit rather variable in size, sometimes 3.7 cm. long, becoming dry in age, with a depressed umbilicus; seeds black, dull, 2 mm. long.

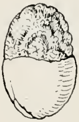


Fig. 57.—Seed of Phellosperma tetrancistra.

Type locality: San Felipe, California.

Distribution: Western Arizona, southeastern California, southern Utah, and southern Nevada; probably northern Lower California.

Mr. C. R. Orcutt, under date of March 5, 1922, comments on the distribution of this plant as follows:

> "It reaches its greatest development on sandy and gravelly slopes near the White Water River east of Banning, California. It no doubt enters Lower California, for I believe that I have found it within a mile of the boundary line. It is comparatively rare in Arizona."

We have seen no specimens from Utah, but suspect that the plants from that state which have been referred to *Mammillaria grahamii* probably belong here. The species should be looked for in northern Lower California and Sonora.

Illustrations: Cact. Mex. Bound. pl. 7; Engler and Prantl, Pflanzenfam. 3^{6a}: 162. f. 56, B; Cact. Journ. **1:** pl. for February; Bol. Direccion Estudios Biol. **2:** f. 3; Monatsschr Kakteenk. **20:** 167, as *Mammillaria phellosperma.*

Figure 58 is from a photograph of a plant sent from California in 1921 by E. C. Rost; figure 57 shows a seed taken from a plant sent by Loren G. Polhamus in 1921 from Bard, California.

12. DOLICHOTHELE (Schumann) gen. nov.

Plant-body globose, more or less cespitose, soft in texture, never milky; tubercles elongated, not grooved above; flowers borne in axils of old tubercles, very large, with a definite funnel-shaped tube; inner perianth-segments yellow, spatulate, tapering into a claw and borne on top of tube; stamens forming a spiral about style and borne on whole face of throat, but forming a definite ring at top of throat; style slender; stigma-lobes linear; ovary exserted, naked; fruit smooth, greenish, purplish, or red, globose, ellipsoid or short-oblong; seeds black or brownish.

Type species: *Mammillaria longimamma* De Candolle.

The generic name is from the Greek, meaning long, and from the Greek, meaning nipple, referring to the elongated tubercles.

The fruit is not often collected and is not well known. Dr. Rose obtained a single fruit of one of the species, the only we had then seen, in a private collection in Rome in 1915; this is nearly globular, red, thin-walled, many-seeded; the seeds are brownish, pitted, slightly flattened, pointed at base, with a small sub-basal hilum. In October 1921, Robert Runyon sent us a number of fruits which were greenish white to purplish, with black seeds, these somewhat flattened and pitted.

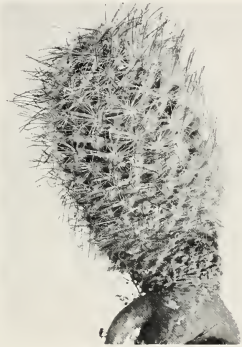


FIG. 58.—Phellosperma tetrancistra.

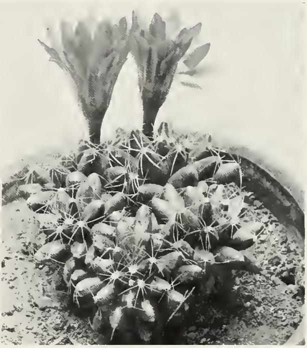


FIG. 59.—Dolichothele longimamma.

Mammillaria camptotricha Dams (Gartenwelt **10:** 14. 1905) is usually considered as a close relative of this group, but it differs widely from it in the flowers as well as in other ways, and we believe that it is not congeneric with it (see page 126).

Three species, natives of southern Texas and northern and central Mexico, are recognized.

KEY TO SPECIES.

Spines glabrous, even when young; species of Texas and northern Mexico........................1. *D. sphaerica*
Spines puberulent; species of central Mexico.
  Tubercles very long (sometimes 5 cm. long), pale green, glaucous; radials 6 or more; central spines usually present..2. *D. longimamma*
  Tubercles much shorter, bright green; radial spines 4 or 5; central spines none................3. *D. uberiformis*

1. Dolichothele sphaerica (Dietrich).

Mammillaria sphaerica Dietrich in Poselger, Allg. Gartenz. *21:* 94. 1853.
Cactus sphaericus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Mammillaria longimamma sphaerica K. Brandegee, Cycl. Amer. Hort. Bailey *2:* 975. 1900.

Low and depressed, often growing in large cespitose masses 2 dm. in diameter, with a large thickened root; tubercles soft and turgid, resembling those of the following species (*D. longimamma*) but shorter, 12 to 16 mm. long; areoles small, circular, at first short-lanate; spines 12 to 15, glabrous, generally pale yellow, a little darker at base at first, in age darker, often reddish, 7 to 9 mm. long, spreading or a little curved backward; central spine 1, straight; flowers appearing toward top of plant but not from axils of younger tubercles, with a rotate limb 6 to 7 cm. broad; inner perianth-segments widely spreading, oblanceolate, acute to apiculate, tapering at base into a slender claw; stigma-lobes 8, yellow, narrow; fruit greenish white to purplish, short-oblong, 10 to 15 mm. long, juicy, very fragrant; seeds black, flattened, with a straight ventral face, rounded on the back, pitted; hilum subventral.

Type locality: Near Corpus Christi, Texas.

Distribution: Southern Texas and northern Mexico, especially along the Rio Grande from Eagle Pass to the sea.

Mr. R. D. Camp and Mr. Robert Runyon have recently found this species in abundance about Brownsville. With the aid of their material and the excellent photograph made by Mr. Runyon we have been able to present a detailed description of this plant.

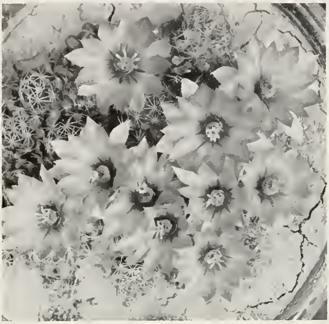


Fig. 60.—Dolichothele sphaerica.

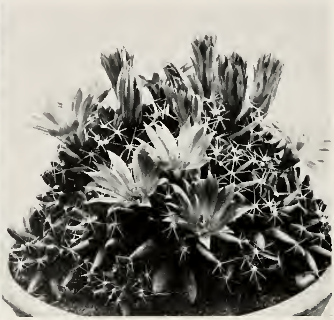


Fig. 61.—Dolichothele longimamma.

According to Mr. Runyon, the flowers are very large and handsome. The fruit does not ripen until about the middle of October, and in one plant a single fruit continued to grow until the 27th of March and had a pronounced pleasing odor. This is the first case which has come under our notice in which any of the *Coryphanthanae* develop any odor in the fruits.

Illustration: Haage and Schmidt, Haupt-Verz. **1912:** 36, as *Mammillaria sphaerica.*

Plate I, figure 2, is from a photograph sent us by Robert Runyon from Brownsville, Texas; plate VII, figure 2, shows a fruit and figure 2*a* shows a seed from a plant collected by Mr. Runyon at Brownsville in 1921. Figure 60 is from a photograph of a flowering plant made by Mr. Runyon at Brownsville in 1921.

2. Dolichothele longimamma (De Candolle).

Mammillaria longimamma De Candolle, Mém. Mus. Hist. Nat. Paris *17:* 113. 1828.
Mammillaria longimamma hexacentra Berg, Allg. Gartenz. *8:* 130. 1840.
Mammillaria longimamma gigantothele Berg in Förster, Handb. Cact. 183. 1846.
Mammillaria longimamma congesta Hortus in Förster, Handb. Cact. 183. 1846.
Mammillaria uberiformis hexacentra Salm-Dyck, Cact. Hort. Dyck. 1849. 6. 1850.

Mammillaria melaleuca Karwinsky in Salm-Dyck, Cact. Hort. Dyck. 1849. 108. 1850.
Mammillaria globosa Link, Allg. Gartenz. *25:* 240. 1857.
Mammillaria uberiformis gracilior Meinshausen, Wöchenschr. Gärtn. Pflanz. *1:* 26. 1858.
Mammillaria longimamma luteola Hortus in Förster, Handb. Cact. ed. 2. 246. 1885.
Cactus longimamma Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus melaleucus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Mammillaria longimamma globosa Schumann, Gesamtb. Kakteen 508. 1898.

Solitary or cespitose, about 10 cm. high; tubercles elongated, 5 cm. long, somewhat glaucous, their axils hairy or naked; spine-areoles with white hairs when young, in age naked; radial spines 6 to 12, widely spreading, acicular, 2.5 mm. long, white to pale yellow, swollen and darker at base, puberulent; central spines 1 to 3, usually solitary, porrect, similar to the radials but usually darker with a blackish tip; flowers citron-yellow, 4 to 6 cm. long.

Type locality: Mexico.

Distribution: Central Mexico.

F. Haage jr. in his Choice Cacti lists ten varieties under this species; those not accounted for elsewhere are *ludwigii* and *melaleuca.*

Grässner in his Kakteen 1912 and also 1914 listed *Mammillaria longimamma* var. *ludwigii.* This may be a printer's error.

Mammillaria longimamma melaleuca is in the trade (Grässner). *Mammillaria longimamma pseudo-melaleuca* is advertised by Haage and Schmidt in their 1922 Catalogue.

Mammillaria longimamma spinosior (Wöchenschr. Gärtn. Pflanz. 1: 26. 1858), credited to Link's Catalogue, but without description, is of this relationship.

Mammillaria hexacentra Otto and *Mammillaria gigantothele* (Förster, Handb. Cact. 183. 1846) were never described.

Krook (Handb. Cact. 41. 1855) mentions the variety *congesta* Hortus but gives no description. Several varieties of *Mammillaria longimamma* are in gardens; the following are mentioned by Schelle: *cristata, compacta* (the name cited by Rümpler in 1885), *major, laeta,* and *malaena.*

Mammillaria centricirrha flaviflora is referred by Schumann as a synonym of *M. melaleuca* which we have listed among the synonyms of *Dolichothele longimamma. M. alpina* Martius mentioned elsewhere, may be of this relationship.

Illustrations: Monatsschr. Kakteenk. **29:** 81, as *Mammillaria longimamma globosa;* Möllers Deutsche Gärt. Zeit. **25:** 475. f. 8, No. 23, as *M. longimamma gigantothele;* Blühende Kakteen **2:** pl. 73; De Candolle, Mém. Cact. pl. 5; Schumann, Gesamtb. Kakteen 792. f. 114; Monatsschr. Kakteenk. **8:** 149; Schelle, Handb. Kakteenk. 244. f. 162; Förster, Handb. Cact. ed. 2. f. 22, a and b; Ann. Rep. Smiths. Inst. **1908:** pl. 14, f. 2; Watson, Cact. Cult. 164. f. 63; ed. 3. f. 40; Dict. Gard. Nicholson **4:** 564. f. 35; Suppl. 516. f. 551; De Laet, Cat. Gén. f. 89, as *Mammillaria longimamma.*

Figure 61 is from a photograph obtained from L. Quehl; figure 59 is from a photograph of the plant collected by Dr. E. Palmer near Victoria, Mexico, in 1907.

3. **Dolichothele uberiformis** (Zuccarini).

Mammillaria uberiformis Zuccarini in Pfeiffer, Enum. Cact. 23. 1837.
Mammillaria uberiformis major Hortus in Förster, Handb. Cact. ed. 2. 244. 1885.
Mammillaria uberiformis variegata Hortus in Förster, Handb. Cact. ed. 2. 244. 1885.
Mammillaria laeta Rümpler in Förster, Handb. Cact. ed. 2. 247. 1885.
Cactus uberiformis Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Mammillaria longimamma uberiformis Schumann, Gesamtb. Kakteen 508. 1898.

Globose, about 7.5 cm. high and 10 cm. in diameter; tubercles elongated, 2.5 to 3 cm. long, 12 to 15 mm. in diameter, bright green, shining, their axils naked; spine-areoles nearly naked; spines 4 or 5, all radial, puberulent, horn-colored to reddish, nearly equal; flowers yellow, 3 cm. broad; outer perianth-segments reddish; inner perianth-segments in 2 series, oblong, acute, acuminate; filaments white; style yellow; stigma-lobes 5 or 6, reflexed.

Type locality: Near Pachuca, Mexico.

Distribution: Central Mexico.

Illustrations: Pfeiffer and Otto, Abbild. Beschr. Cact. **1**: pl. 13; Abh. Bayer. Akad. Wiss. München **2**: pl. 1, VII. f. 6; Rümpler, Sukkulenten 196. f. 109, as *Mammillaria uberiformis.*

Figure 62 is reproduced from the first illustration cited above.

13. SOLISIA gen. nov.

Plants very small, solitary, globular, tuberculate, milky; tubercles not arranged in ribs, small, covered by broad pectinate spines; areoles very narrow and long; flowers lateral, yellow, small, borne in axils of old tubercles; axils of tubercles neither hairy nor woolly; fruit naked, small, oblong; seeds black smooth dome-shaped with a broad basal hilum.

The type species, *Pelecyphora pectinata* B. Stein, is here segregated from *Pelecyphora,* with which it has little in common; it differs in being solitary, not cespitose, and in having the juice milky, not watery; the flowers small, lateral and yellow, not large, central and purple; the axils of the tubercles naked, not woolly; and the hilum of the seed broad and large, not small.

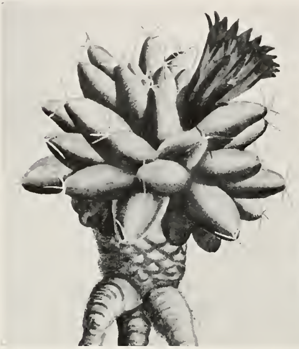


FIG. 62.—Dolichothele uberiformis.

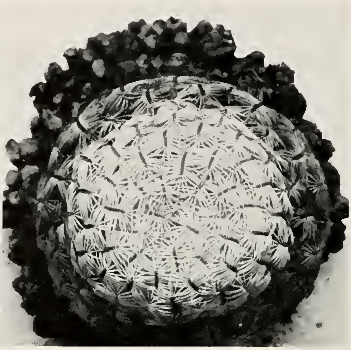


FIG. 63.—Solisia pectinata.

The genus is named in honor of Octavio Solís of the City of Mexico, an earnest student of the cacti. Only one species is known.

1. Solisia pectinata (B. Stein).

Pelecyphora pectinata B. Stein, Gartenflora *34:* 25. 1885.
Pelecyphora aselliformis pectinifera Rümpler in Förster, Handb. Cact. ed. *2:* 238. 1885.
Pelecyphora aselliformis pectinata Nicholson,* Dict. Gard. *4:* 585. 1888.
Pelecyphora aselliformis cristata Watson, Cact. Cult. 190. 1899.
Mammillaria pectinifera Weber, Dict. Hort. Bois 804. 1898.

Plants 1 to 3 cm. in diameter, fibrous-rooted, entirely hidden by the large overlapping spine-clusters; areoles narrow and long; spines 20 to 40, all radial, 1.5 to 2 mm. long, white, appressed; flowers small; fruit 6 mm. long; seeds 1 mm. long.

Type locality: Mexico.

Distribution: Tehuacán, Mexico.

The cristate form of this species, when grown as a graft on some of the *Cereus* allies, becomes much larger than the normal form.

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* Haage (Cact. Kultur ed. 2. 206. 1900) credits the variety to Ehrenberg.

This plant is very rare in living collections and is known only from a few localities near Tehuacán; one of these is near El Riego Hotel, where Dr. Rose obtained some 50 plants in 1905 but all have since died. We have been endeavoring since to obtain additional plants but Dr. Reko reports that this hill has been burned over and that no plants can now be found. Dr. Rose found it scattered over the top and side of a rounded hill, growing here and there among the stones and stunted plant life, looking not unlike the dull earth and pebbles.

Illustrations: Gartenflora **34:** 25; Garten-Zeitung **4:** 182. f. 42, No. 14; 217. f. 48; Grässner, Kakteen **1912:** 29; Ann. Rep. Smiths. Inst. **1908:** pl. 14, f. 5; Möllers Deutsche Gärt. Zeit. **25:** 477. f. 11, No. 4; **29:** 88. f. 10 (abnormal form), as *Pelecyphora pectinata;* Monatsschr. Kakteenk. **29:** 81; Schelle, Handb. Kakteenk. 275. f. 198; Garten-Zeitung **4:** 217. f. 49, as *P. pectinata cristata:* Monatsschr. Kakteenk. **3:** 172. f. 5, as *P. aselliformis pectinata.*

Figure 63 is from an enlarged photograph showing the top of a plant, collected by Dr. Rose at Tehuacán in 1905.

14. **NEOMAMMILLARIA** nom. nov.

Mammillaria [*] Haworth, Syn. Pl. Succ. 177. 1812. Not Stackhouse, 1809.

Plants globose, depressed-globose, or short-cylindric, occasionally much elongated, some with milky, others with watery juice; tubercles arranged in more or less spiraled rows, never on vertical ribs, terete, angled or sometimes flattened, never grooved on upper surface, usually bearing wool or hairs and sometimes bristles, but without glands in their axils and crowned by the spine-areoles; spines in clusters on top of tubercles, sometimes all alike, sometimes with central ones very different from the radial, all straight or sometimes one or more of central spines hooked; flowers, so far as known, diurnal, all from axils of old tubercles, much alike as to size and shape, more or less campanulate, comparatively small, variously colored, commonly red, yellowish or white to pinkish; perianth-segments rather narrow, spreading; stamens numerous, borne on base of perianth-tube, short, included; style about length of stamens; stigma-lobes linear; fruit usually clavate, rarely if ever globose, usually ripening rapidly, naked, scarlet (*Mammillaria brandegeei* with some scales and white fruit, according to Schumann), or white or greenish in a few species; seeds brown in some species, black in others.

The type is *Mammillaria simplex* Haworth, based on *Cactus mammillaris* Linnaeus.

We have given much time in attempting to group the species into definite series but have not succeeded, since many of the species are little known and incompletely described.

The name, *Neomammillaria*, as here used, replaces the name *Mammillaria* of Haworth (1812), which is a homonym of the *Mammillaria* of Stackhouse (1809), a genus of *Algae*.

The genus, as here treated, differs from Schumann's treatment (Gesamtb. Kakteen 472-601, 1898) in that we exclude three of his four subgenera, *Coryphantha, Dolichothele,* and *Cochemiea,* giving them generic rank. From his fourth subgenus we have excluded *Mammillaria micromeris* as the type of the genus *Epithelantha* [†] and *M. phellosperma* to the genus *Phellosperma* (see page 60).

The species, of which we recognize 150, are native chiefly of Mexico, extending northward into the southwestern United States; one species is reported as far north as Utah and Nevada. Two species are known from the West Indies (none is found in Jamaica or in the Lesser Antilles south of Antigua). Several species are known from Central America (none has been reported from Costa Rica, El Salvador, or Panama). One species is found in Venezuela and neighboring islands and one is described from Colombia, perhaps in error.

During the period of our investigation political conditions in Mexico have prevented our obtaining much original information concerning many of the species and have made it necessary for us to depend largely upon published descriptions and illustrations.

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[*] The name was also spelled *Mammilaria* by Torrey and Gray (Flora *1:* 553) and *Mamillaria* by Reichenbach (Mössler, Handb. ed. 2. *1:* 1. 1827) and by Schumann (Gesamtb. Kakteen 472 and elsewhere).

[†] See Cactaceae, *3:* 92. 1922.

KEY TO SPECIES.

A. None of spines hooked (1-104, 150).
B. Seeds brown (1-80).
C. Tubercles giving off milk freely when pricked or cut (1-53).
D. Axils of tubercles without bristles (1-33).
E. Tubercles more or less elongated.
F. Tubercles terete throughout.
Spines yellow or reddish.
Spines red .... 1. *N. mammillaris*
Spines yellow .... 2. *N. nivosa*
Spines usually white except tips, at least not red or yellow.
Central spines 1 or 2.
Central spines about length of radials.................... 3. *N. gaumeri*
Central spines much longer than radials.................... 4. *N. petrophila*
Central spines 4 to 7.
Outer perianth-segments entire; central spines long, slender.................... 5. *N. arida*
Outer perianth-segments erose; central spines not elongated, stouter than in preceding species .... 6. *N. brandegeei*
FF. Tubercles more or less angled.
G. Tubercles nearly terete towards apex.
Outer perianth-segments and scales more or less fimbriate.
Flowers reddish .... 7. *N. gummifera*
Flowers light yellow.................... 8. *N. macdougalii*
Outer perianth-segments and scales entire.
Radial spines white; flowers pinkish.................... 9. *N. heyderi*
Radial spines brownish; flowers white to cream-colored.
Plant hemispheric; radial spines 9 to 13; perianth-segments acute....................10. *N. hemisphaerica*
Plant much flattened; radial spines 18 or fewer; perianth-segments acuminate ....11. *N. applanata*
GG. Tubercles angled to top.
H. Spines very unequal, some much elongated.
Spines whitish ....12. *N. phymatothele*
Spines horn-colored, reddish or black.
No definite central spine.
Spines horn-colored, short, curved....................13. *N. magnimamma*
Spines reddish, long....................14. *N. macracantha*
Central spines definite.
Central spines 2....................15. *N. johnstonii*
Central spines solitary.
Central spine 2 to 3 cm. long....................16. *N. melanocentra*
Central spine 1 cm. long; oblong....................17. *N. runyonii*
HH. Spines nearly equal, at least none much elongated.
Flowers red to pinkish.
Outer perianth-segments ciliate....................18. *N. sartorii*
Outer perianth-segments not ciliate (so far as known).
Central spines none.
Spines pinkish with black tips....................19. *N. seitziana*
Spines straw-colored throughout....................20. *N. ortegae*
Central spines 1 or more.
Central spines solitary; radial spines nearly equal....................21. *N. meiacantha*
Central spines 2; some of radials very short....................22. *N. scrippsiana*
Flowers yellowish.
Central spines 4 to 6....................23. *N. gigantea*
Central spines usually wanting....................24. *N. peninsularis*
EE. Tubercles very short, symmetric.
F. Plants globose or depressed.
G. Axils of tubercles naked....................25. *N. flavovirens*
GG. Axils of tubercles laniferous.
Some of spines deciduous....................26. *N. sempervivi*
None of spines deciduous.
Central spines present.................... 27. *N. obscura*
Central spines wanting ....28. *N. crocidata*
FF. Stems cylindric or ovoid.
Central spines wanting.
Tubercles nearly terete ....29. *N. polythele*
Tubercles 4-angled.
Tubercles pointed; axils very woolly....................30. *N. carnea*
Tubercles not pointed; axils not very woolly....................31. *N. lloydii*
Central spines several.
Radial spines reduced to short bristles....................32. *N. zuccariniana*
Radial spines more elongated than in last species....................33. *N. formosa*

DD. Axils of tubercles with bristles as well as wool (33-53).
E. Some of spines much elongated, curved, and flexuous.
Definite central spines wanting.......34. *N. compressa*
Central spines present.
Central spines weak.......35. *N. mystax*
Central spines stiff.......36. *N. petterssonii*
EE. None of spines elongated, or if elongated, not flexuous.
F. Tubercles terete or nearly so.
G. Axils of tubercles bearing yellow wool.......37. *N. eichlamii*
GG. Axils of tubercles bearing white wool.
H. Spines all radial.
Spines 5 or 6, in young plants sometimes only 4.......38. *N. karwinskiana*
Spines always 4.......39. *N. praelii*
HH. Spines both radial and central.
I. Radial spines numerous, 12 or more.
Central spines reddish, not much longer than the radials.
Outer perianth-segments ciliate.......40. *N. standleyi*
Outer perianth-segments setose.......41. *N. evermanniana*
Central spines elongated, usually white except at tip.
Flowers yellow.......42. *N. parkinsonii*
Flower dark red.......43. *N. geminispina*
II. Radial spines few, 5 to 9.
Spines black when young.......44. *N. pyrrhocephala*
Spines at most brownish.
Flowers yellow.......45. *N. woburnensis*
Flowers pinkish.......46. *N. collinsii*
FF. Tubercles strongly angled.
G. Spines both radial and central.
Radial spines numerous.......47. *N. chinocephala*
Radial spines few, bristle-like.
Central spines 4 to 6.......48. *N. tenampensis*
Central spines 2.......49. *N. polygona*
GG. Spines few, all of one kind.
Flowers yellow.......50. *N. confusa*
Flowers rose-colored or white.
Flowers rose-colored.
Plants globose; stigma-lobes 4 or 5.......51. *N. villifera*
Plants cylindric; stigma-lobes 8.......52. *N. polyedra*
Flowers white.......53. *N. conzattii*
CC. Milk-tubes developed, if at all, only in stem; tubercles not milky (54-80).
D. Central spines wanting.
Spines subulate; areoles elliptic.......54. *N. napina*
Spines mostly acicular; areoles circular.
Spines numerous.......55. *N. lanata*.
Spines few (4 to 6).
Spines 5 or 6, short, straight.......56. *N. kewensis*
Spines 4, elongated, curved.
Flowers large (2.5 cm. broad).......57. *N. subpolyedra*
Flowers small.
Spines long and weak.......58. *N. galeottii*
Spines subulate.......59. *N. tetracantha*
DD. Central spines present.
E. Central spines usually 2, sometimes solitary.
F. Radial spines 20 or more.
Central spines stout and not very long; stigma-lobes white.
Plant round or nearly so at apex; central spine often 1.......60. *N. elegans*
Plant strongly umbilicate; central spines always 2.......61. *N. pseudoperbella*
Central spines long.......62. *N. dealbata*
FF. Radial spines 20 or fewer.
Radial spines white, bristle-like.
Stigma-lobes red.
Globose or somewhat elongated.......63. *N. haageana*
Depressed-globose.......64. *N. perbella*
Stigma-lobes white.
Radial spines appressed.......65. *N. collina*
Radial spines not appressed.......66. *N. donatii*
Radial spines brownish when young, stouter than in the last.......67. *N. mundtii*
EE. Central spines usually 4, sometimes more.
F. Central spines white or yellow.
Radial spines white.
Plant globose.
Axils of tubercles not setose; central spines usually 4.......68. *N. celsiana*
Axils of tubercles setose; central spines usually 9.......69. *N. aureiceps*
Plant cylindric.
Plants from Yucatan.......70. *N. yucatanensis*
Plants from Central America.......71. *N. ruestii*

Radial spines yellow.
Plants globular .... 72. *N. pringlei*
Plants slender-cylindric .... 73. *N. cerralboa*
FF. Central spines brown or black.
Central spines black.......... 74. *N. phaeacantha*
Central spines brown.
Axils of tubercles not setose.......... 75. *N. graessneriana*
Axils of tubercles setose.
Tubercles closely set.
Central spines not very different from radial.
Plant body elongated; spines brownish or reddish..... 76. *N. spinosissima*
Plant body globose; radial spines whitish............ 77. *N. densispina*
Central spines very different from the radial............ 78. *N. nunezii*
Tubercles spreading.
Central spines unequal; stigma-lobes green............. 79. *N. amoena*
Central spines nearly equal; stigma-lobes rose-colored.... 80. *N. rhodantha*
BB. Seeds black; neither tubercles nor stems milky (81-104).
C. Spines plumose .... 81. *N. plumosa*
CC. Spines not plumose.
D. Radial spines weak and hair-like.
Central spines with yellow tips.......... 82. *N. prolifera*
Central spines with brown tips.......... 83. *N. multiceps*
DD. Radial spines not hair-like.
E. Spines yellow.
Spines 2 to 8, glabrous, more or less twisted or bent............. 84. *N. camptotricha*
Spines about 20, pubescent, straight.......... 85. *N. eriacantha*
EE. Spines not yellow.
F. Spines 25 to 80.
Spines pubescent or lanate.
Spines lanate, 25 to 30.......... 86. *N. schiedeana*
Spines pubescent or puberulent.......... 87. *N. lasiacantha*
Spines not pubescent.
Spines all very much alike.
Perianth-segments obtuse .... 88. *N. denudata*
Perianth-segments pointed.
Flowers about 7 mm. long.......... 89. *N. lenta*
Flowers about 2 cm. long.......... 90. *N. candida*
Central spines 1 to 6, very unlike others................ 91. *N. vetula*
FF. Spines 20 or fewer but sometimes more in *N. oliviae* and *N. pottsii*.
Plant globose.
Flowers red .... 92. *N. fertilis*
Flowers white.
Central spines solitary; radials 7 to 9................ 93. *N. decipiens*
Central spines 5 to 8; radials 16 to 20................ 94. *N. discolor*
Plant cylindric.
Joints very fragile, breaking loose when touched or jarred.. 95. *N. fragilis*
Joints not fragile.
Spines all radial, recurved, sometimes with one central.. 96. *N. elongata*
Spines both radial and central.
Plants globose to short-cylindric.................. 97. *N. oliviae*
Plants slender-cylindric.
Axils of tubercles not bristly.
Spines all yellow .... 98. *N. echinaria*
Spines not yellow.
Upper central spines more or less connivent over top of plant .... 99. *N. pottsii*
Upper central spines not connivent...........100. *N. mazatlanensis*
Axils of tubercles bristly.
Stems slender-cylindric; central Mexican species..101. *N. sphacelata*
Stems short-cylindric or globose (sometimes globose in *N. palmeri*); Lower Californian species.
Spines nearly white or at least becoming so; seeds minute.
Spines all white or nearly so; spine-areoles at first lanate ....102. *N. albicans*
Spines tan with dark tips; spine-areoles not lanate ....103. *N. slevinii*
Spines not white; seeds 3 mm. long..........104. *N. palmeri*
AA. Some of central spines hooked; radial spines never hooked (105-149).
B. Tubercles milky; seeds brown.
Plants globose ....105. *N. uncinata*
Plants cylindric ....106. *N. hamata*
BB. Tubercles not milky except sometimes in *N. rekoi;* seeds mostly black.
C. Seeds brown.
Fruit red; flowers from side of plant..........107. *N. rekoi*
Fruit green; flowers from near base of plant..........108. *N. solisii*

CC. Seeds black.
D. Fruit elongated, clavate, ripening quickly.
E. Seeds not rugose.
F. Plants usually small; spines setaceous to delicately acicular.
Central spines yellow.
Central spines glabrous .... 109. *N. pygmaea*
Central spines pubescent.
Flowers white .... 110. *N. wildii*
Flowers yellowish .... 111. *N. seideliana*
Central spines red to brown.
Outer perianth-segments ciliate.
Central spines shorter than flower; perianth-segments acute... 112. *N. barbata*
Central spines longer than flower; perianth-segments obtuse.. 113. *N. mercadensis*
Outer perianth-segments entire.
Axils of tubercles setose.
Inner perianth-segments white to yellowish.
Central spines 3 or 4.
Radial spines about 25; flowers 2 cm. long.......... 114. *N. kunzeana*
Radial spines about 20; flowers 1 cm. long.......... 115. *N. hirsuta*
Central spines 7 to 9.......... 116. *N. multihamata*
Inner perianth-segments red or reddish.
Radial spines weak and hair-like.
Central spines several.......... 117. *N. longicoma*
Central spine solitary.......... 118. *N. bocasana*
Radial spines stiff.
Radial spines glabrous.......... 119. *N. multiformis*
Radial spines pubescent.......... 120. *N. scheidweileriana*
Axils of tubercles not setose.
Flowers 2.2 cm. long or more.
Central spines solitary.......... 121. *N. saffordii*
Central spines 3 .... 122. *N. schelhasei*
Flowers 1 to 1.5 cm. long.
Plants cespitose .... 123. *N. glochidiata*
Plants solitary.
Inner perianth-segments acuminate.......... 124. *N. trichacantha*
Inner perianth-segments acute only.......... 125. *N. painteri*
FF. Plants stout; central spines at least stout-acicular to subulate.
G. Outer perianth-segments ciliate.
Fruit purple, ovoid to globular.
Radial spines 15 or less; fruit large (25 mm. long)...... 126. *N. wrightii*
Radial spines 20 to 30; fruit 10 to 15 mm. long........ 127. *N. viridiflora*
Fruit scarlet, clavate.
Outer perianth-segments long-ciliate.......... 128. *N. wilcoxii*
Other perianth-segments and upper scales short-ciliate.
Perianth rotate; stigma-lobes red .... 129. *N. mainae*
Perianth campanulate; stigma-lobes green.
Flowers white .... 130. *N. boedekeriana*
Flowers purple to pinkish.
Radial spines often as many as 30.
Inner perianth-segments acuminate.......... 131. *N. microcarpa*
Inner perianth-segments usually obtuse or rounded .... 132. *N. milleri*
Radial spines often as few as 12; inner perianth-segments acute .... 133. *N. sheldonii*
GG. Perianth-segments not ciliate.
H. Setae in axils of tubercles.
I. Seeds constricted above base.
J. Flowers greenish or pink, and small.
K. Flowers greenish, 10 to 12 mm. long; central spines yellowish to reddish.......... 134. *N. armillata*
KK. Flowers pink, 20 mm. long or more; central spines dark brown.......... 135. *N. fraileana*
JJ. Flowers nearly white, seeds much larger.......... 136. *N. swinglei*
II. Seeds not constricted above base.
Central spines several; flowers yellowish.......... 137. *N. dioica*
Central spines usually solitary; flowers rose-colored. 138. *N. goodridgei*
HH. Setae wanting in axils of tubercles.
I. Flowers rotate .... 139. *N. zephyranthoides*
II. Flowers campanulate.
Plants globose.
Flowers white .... 140. *N. carretii*
Flowers pink to purplish.
Inner perianth-segments obtuse.......... 141. *N. jaliscana*
Inner perianth-segments acute to acuminate.... 142. *N. bombycina*
Plants slender, elongated and cylindric.
Flowers small, pinkish.......... 143. *N. occidentalis*
Flowers large, purplish.......... 144. *N. fasciculata*
EE. Seeds rugose (perhaps a generic type).......... 145. *N. nelsonii*
DD. Fruit depressed, long-persisting (perhaps a generic type).......... 146. *N. longiflora*
AAA. Species not grouped: 147, *N. tacubayensis;* 148, *N. umbrina;* 149, *N. verhaertiana;* 150, *N. xanthina.*

1. Neomammillaria mammillaris (Linnaeus).

Cactus mammillaris Linnaeus, Sp. Pl. *1:* 466. 1753.
Cactus mammillaris glaber De Candolle, Pl. Succ. 137. 1799.
Mammillaria simplex Haworth, Syn. Pl. Succ. 177. 1812.
?*Mammillaria conica* * Haworth, Suppl. Pl. Succ. 71. 1819.
Mammillaria parvimamma Haworth, Suppl. Pl. Succ. 72. 1819.
Cactus microthele Sprengel, Syst. *2:* 494. 1825.
Mammillaria simplex parvimamma Lemaire, Cact. Gen. Nov. Sp. 98. 1839.
Mammillaria caracassana † Otto in Salm-Dyck, Cact. Hort. Dyck. 1849. 107. 1850.
Mammillaria mammillaris Karsten, Deutsche Fl. 888. 1882.
?*Cactus conicus* Kuntze, Rev. Gen. Pl. *1:* 259. 1891.
Cactus parvimammus Kuntze, Rev. Gen. Pl. *1:* 259. 1891.

Globose to short-cylindric, 4 to 6 cm. high; tubercles short, 5 to 7 mm. long, conic, nearly terete, pale green, only slightly woolly in their axils; spine-areoles bearing a dense mass of white wool when young; spines reddish brown, acicular; radial spines 10 to 12, spreading, 5 to 7 mm. long; central spines 3 or 4, stouter and a little longer than the radials; flowers 8 to 10 mm. long, cream-colored; outer perianth-segments narrow, bearing long mucronate tips; fruit 15 to 20 mm. long, red; seeds minute, brown.

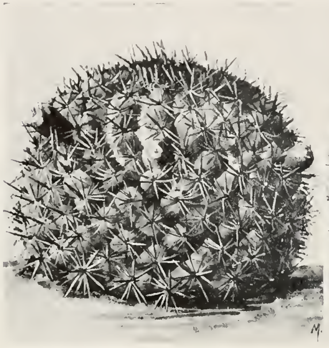
Fig. 64.—Neomammillaria mammillaris.

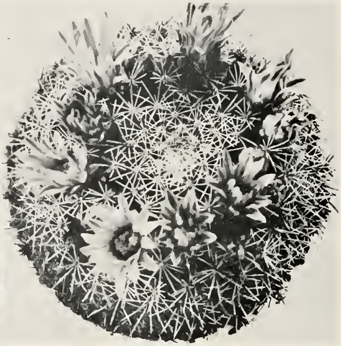
Fig. 65.—Neomammillaria macdougalii.

Type locality: Tropical America.

Distribution: Northern Venezuela and neighboring Dutch Islands.

This plant was the first known species of the genus and the only one known to Linnaeus; it was described and illustrated by Commelin in 1697 and by Hermann in 1698. It was one of the first cacti discovered; Aiton states that it was cultivated by Bishop Compton before 1688. The cited distribution of the species has usually been inexact or erroneous; Linnaeus gave no definite locality but restricted it to the warm parts of America.

Nuttall assigns it also to the hills of the Missouri River, and De Candolle's range covers that of both Linnaeus and of Nuttall. Nuttall's plant was subsequently found to be different from the one of the Caribbean region. Schumann gives the range as the West Indies but his description covers two or three species. A number of his references are erroneous, for neither Wright's plant (No. 2619, as *Mammillaria pusilla*) from Cuba nor Haworth's plant (Syn. Pl. Succ. 177, as *Mammillaria prolifera*) from the West Indies belongs here. The name *Cactus*

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* Tubercles large, conic; spines less than 10, all radial, red, but paler at base; flowers and fruit unknown. Neither Pfeiffer nor Schumann knew this species or its origin. The Index Kewensis refers it to South America. If from that region it might be a species of *Discocactus,* near *D. placentiformis,* but it may belong here.

† This is the original spelling, but Schumann wrote it *M. caracasana.*

prolifer Willdenow (Pfeiffer, Enum. Cact. 9. 1837) is doubtless to be referred here. Fawcett lists the plant from Jamaica (as *Mammillaria simplex*) but no specimens are known to us from that island, which was searched by Dr. Britton and the late Mr. William Harris.

De Tussac (Fl. Antill. 2: 216, pl. 32) refers it to Santo Domingo and he describes and figures it, mentioning a locality in the desert near Gonaives which, however, is in Haiti; his illustration, while undoubtedly of this species, is not an original but copied from that of De Candolle (Pl. Succ. pl. 111). The only similar plant we know from his locality is *Mammillaria pusilla,* described as *M. pusilla haitiensis* by Schumann, which has been collected by Buch at this locality, and we have specimens from other collectors. We now believe that *Neomammillaria mammillaris* is confined to the coast of Venezuela and the adjacent islands, among which is Curaçao. In 1913 Dr. Britton and Dr. Shafer found it common on the top of a limestone hill in Curaçao (No. 3085) and in the same year Mr. Pittier obtained living plants near Cabo Blanco, Venezuela (No. 6471). These two are the only collections which have been made in recent years.

Steudel (1821), under *Mammillaria simplex,* compares this species with *Cereus flavescens* and *C. lanuginosus,* but he must have meant *Cactus* instead of *Cereus.*

Mammillaria microthele Monville and *M. micrantha* Hortus are names which Rümpler (Förster, Handb. Cact. ed. 2. 335. 1885) refers to *M. caracassana;* Salm-Dyck (Cact. Hort. Dyck. 1844. 9. 1845) also referred to it *M. micracantha* Monville.

Mammillaria simplex affinis Otto is mentioned by Förster (Handb. Cact. 217. 1846), but is not described.

Mammillaria karstenii Poselger (Allg. Gartenz. 21: 95. 1853) is listed by Schumann among his little-known species. The Index Kewensis states that it comes from Argentina, which is doubtless a mistake. The type locality is given as "La Canada," a common Spanish locality name. If collected by Karsten, it probably was obtained in Venezuela, in which case it would probably be referable to *Neomammillaria mammillaris.*

Mammillaria fuliginosa Salm-Dyck (Cact. Hort. Dyck. 1849. 93. 1850) we do not know, but if it came from Venezuela, where it is referred doubtfully by the Index Kewensis, it would belong here.

Illustrations: Hermann, Parad. 132, pl. 137, as *Echinomelocactus minor,* etc.; Commelin, Hort. Amst. 1: 105. f. 55; Plukenet, Opera Bot. 1: 148. pl. 29, f. 1, as *Ficoides,* etc.; Bradley, Hist. Pl. Succ. 3: 11. pl. 29, as melon-thistle; Loudon, Encycl. Pl. ed. 2 and 3. 410. f. 6839; De Candolle, Pl. Succ. 137. pl. 111; Fl. Antill. 2: pl. 32, as *Cactus mammillaris;* De Candolle, Mém. Cact. pl. 7, as *Mammillaria simplex.*

Figure 64 is reproduced from a colored drawing by Miss M. E. Eaton of a plant obtained by Dr. Britton and Dr. Shafer on Curaçao in 1913, which fruited the same year in the New York Botanical Garden.

2. Neomammillaria nivosa (Link).

Mammillaria nivosa Link in Pfeiffer, Enum. Cact. 11. 1837.
Cactus nivosus Kuntze, Rev. Gen. Pl. *1:* 259. 1891.
Coryphantha nivosa Britton, Ann. Mo. Bot. Gard. *2:* 45. 1915.

Often forming large clusters 8 dm. in diameter, of 25 heads or more; separate specimens usually globose but sometimes cylindric, the largest ones 18 cm. in diameter, very spiny; tubercles milky, 10 mm. long, their axils filled with white wool; spines usually 14, bright yellow, acicular, the longer ones 1.5 cm. long; spine-areoles when young woolly, in age naked; flowers cream-colored, 1.5 cm. long; fruit clavate, 12 mm. long, red; seeds brown.

Type locality: Tortola Island, Virgin Islands.

Distribution: Southern Bahamas, Mona, Desecheo, Culebra, Buck Island, St. Thomas, Little St. James Island, Tortola, and Antigua.

Known as the snowy cactus in the Virgin Islands and as the woolly nipple-cactus in the Bahamas.

The plant inhabits crevices of rocks and locally is very abundant. On Mona Island, between Porto Rico and Santo Domingo in the Mona Passage, it exists in immense numbers on the limestone plateau.

Mammillaria tortolensis (Pfeiffer, Enum. Cact. 11. 1837) was published by Pfeiffer as a synonym of *M. nivosa.* The same or similar plant was briefly described by Forbes (Journ. Hort. Tour 148, 1837).

Illustrations: Förster, Handb. Cact. ed. 2. 331. f. 34; Schelle, Handb. Kakteenk. 264. f. 186; De Laet, Cat. Gén. f. 46; Blühende Kakteen 3: pl. 165, as *Mammillaria nivosa.*

Figure 66 is from a photograph of a plant collected on Turks Island, British West Indies, in July 1916 and sent us by the Director of the New York Aquarium; figure 243 (Britton and Rose, Cactaceae 3: p. 231) shows the plant on Mona Island, Porto Rico.

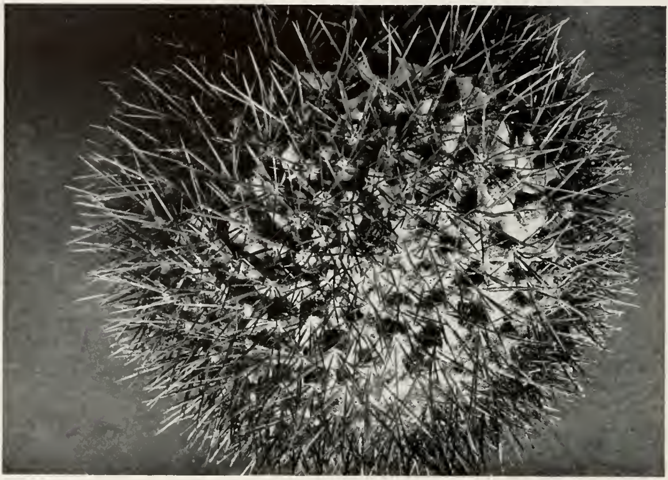


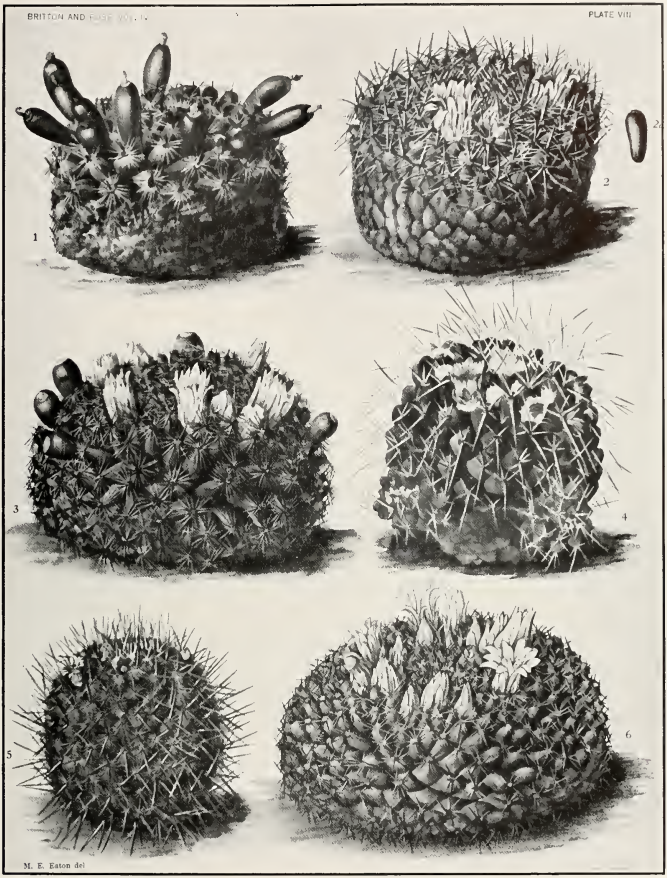
Fig. 66.—Neomammillaria nivosa.

3. Neomammillaria gaumeri sp. nov.

Cespitose, the branches short, globose to short-cylindric, up to 15 cm. long, growing half hidden in the sand; tubercles dark green, short, nearly terete, obtuse, 5 to 7 mm. long, very milky; axils naked even when young; spine-areoles conspicuously white-woolly at first, soon naked; radial spines 10 to 12, spreading, acicular, white with brown tips or lower ones in cluster darker, 5 to 7 mm. long; central spine solitary, porrect, usually brown; flowers very abundant from near top of plant but not from axils of young areoles, creamy white, small, 10 to 14 mm. long; outer perianth-segments greenish, brown-tipped; scales on flower-tube broadly ovate, scarious; fruit crimson, clavate, 18 to 20 mm. long, naked.

Common in the sand dunes of Progreso, Yucatan; collected first by George P. Gaumer and sons, April 1916 (No. 23349, type); re-collected in 1918 and again in 1921.

This species is remarkable for its unusual habitat and was the first of the genus reported from Yucatan. A second species has since been collected by Dr. Gaumer (see p. 114).



1. Fruiting plant of *Neomammillaria gaumeri.*
2. Flowering plant of *Neomammillaria heyderi.*
2*a.* Fruit of same.
3. Flowering and fruiting plant of *Neomammillaria hemisphaerica.*
4. Flowering plant of *Neomammillaria compressa.*
5. Flowering plant of *Neomammillaria geminispina.*
6. Flowering plant of *Neomammillaria hemisphaerica.*

(All three-fourths size.)

It is perhaps nearest some of the species from Texas, such as *N. hemisphaerica* and *N. heyderi,* but when growing it is easily distinguished by the peculiar white mats of wool on the young spine-areoles.

The following interesting note has been contributed by Dr. Gaumer, in whose honor the plant is named:

"The flowers begin to open at 8 a. m., are fully open at noon, close at dawn, and shrink the next morning, leaving the ovary wholly imbedded in the mass of the plant at the base of the tubercles; it remains dormant from 3 to 6 months, then suddenly develops to an inch in length in 48 hours. If put away in a dry place the bright crimson berries last from 3 to 6 months without decaying or changing their color. When thoroughly ripe they have a rather pleasant sweetish taste and are said to be edible.

"The plant multiplies by seed and by segmentation; this latter is accomplished by the plant putting out numerous shoots from its upper surface; these send out roots; the old plant decays and the little ones are often rolled about by the cattle or by the winds, and later send out stronger roots that finally anchor them to the sand, generally under a clump of brush."

Plate VIII, figure 1, shows the type plant which flowered in the New York Botanical Garden, July 24, 1918, soon after its arrival from Yucatan; plate XIII, figure 2, is from a photograph of the plant showing the large masses of white wool at the young spine-areoles.

4. Neomammillaria petrophila (Brandegee).

Mammillaria petrophila Brandegee, Zoe *5:* 193. 1904.

Sometimes cespitose, milky, globular, 15 cm. in diameter or less; tubercles short, broad at base; spines at first chestnut-colored, becoming pale in age; radial spines 10, about 1 cm. long, a little spreading; central spine 1 (rarely 2), 2 cm. long, darker and stouter than the radials; flowers bright greenish yellow, 18 to 20 mm. long; perianth-segments hardly acute, sometimes slightly erose; stamens and style yellow; stigma-lobes 6; fruit small, roundish; seeds reddish brown, smooth, less than 1 mm. long.

Type locality: Sierra de la Laguna, Lower California.

Distribution: Mountains of southern Lower California.

We know this species only from description and illustration.

Illustration: Monatsschr. Kakteenk. 17: 57, as *Mammillaria petrophila.*

5. Nomammillaria arida (Rose).

Mammillaria arida Rose in Quehl, Monatsschr. Kakteenk. *23:* 181. 1913.

Plants usually single, globular, deeply seated in the ground, 3 to 6 cm. in diameter, containing much milk and giving it off freely when injured; tubercles nearly terete; radial spines about 15, pale, ascending, the bases sometimes yellowish and the tips dark; central spines 4 to 7, 12 to 16 mm. long, much longer than the radials, dark brown, erect; flowers 1 cm. long; outer perianth-segments dark purple with lighter margins, entire; inner perianth-segments cream-colored to almost pale yellow; stamens pale; stigma-lobes green; fruit clavate, red, 15 cm. long; seeds brown.

Type locality: Hills near Pichilinque Island near La Paz, Lower California.

Distribution: Known only from the type locality.

Plate VII, figure 3, shows one of the plants collected by Dr. Rose in 1911 which flowered in the New York Botanical Garden, July 2, 1912.

6. Neomammillaria brandegeei (Coulter).

Cactus brandegeei Coulter, Contr. U. S. Nat. Herb. *3:* 96. 1894.
Cactus gabbii Coulter, Contr. U. S. Nat. Herb. *3:*109. 1894.
Mammillaria gabbii Engelmann in K. Brandegee, Erythea *5:* 116. 1897.
Mammillaria brandegeei K. Brandegee, Erythea *5:* 116. 1897.

Cylindric to globular, flattened, solitary or in clusters of 2 to 8; tubercles angled; axils woolly; radial spines 9 to 16, 8 to 10 mm. long, yellowish brown; central spines 3 to 6, a little longer and darker than the radials; flowers 15 mm. long; outer perianth-segments ovate, striate, ciliate; inner perianth-segments greenish yellow, narrower than the outer, entire; fruit white (according to Schumann), bearing a few narrow scales.

Type locality: San Jorge, Lower California.

Distribution: Lower California, San Quintin, and southward.

If we are right in referring *Mammillaria gabbii* here, this species was first collected by W. M. Gabb in southern Lower California in 1867 and was described by Dr. Engelmann as a new species but was not published. In 1894 Dr. Coulter published Engelmann's description, but used the name of *Cactus gabbii.* On a previous page, however, he published *Cactus brandegeei* which, if the same, takes precedence.

We have placed this species next to *Neomammillaria arida,* which is known to have nearly terete tubercles, while *N. brandegeei* is described as having angled tubercles, as they certainly are in herbarium specimens; whether this species has angled or terete tubercles in life we are in doubt.

We have not seen fresh fruit of this plant but Schumann describes it as white, which is unusual in this genus; it is also peculiar in bearing several small scales.

Illustrations: Blühende Kakteen **2:** pl. 119; Schumann, Gesamtb. Kakteen Nachtr. 137. f. 34; Monatsschr. Kakteenk. **11:** 153, as *Mammillaria brandegeei.*

7. Neomammillaria gummifera (Engelmann).

Mammillaria gummifera Engelmann in Wislizenus, Mem. Tour North. Mex. 105. 1848.
Cactus gummifer * Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

Depressed-globose, 8 to 12 cm. in diameter; tubercles light green, milky, somewhat 4-angled; axils of tubercles and spine-areoles white-tomentose when young; radial spines 10 to 12, ascending, white with brownish or even blackish tips, the lower ones stouter and longer than the others, often 2 to 2.5 cm. long and somewhat recurved; central spines 1 or 2, sometimes 4; flowers 3 cm. long, 12 to 25 mm. wide when fully open, brownish red outside; inner perianth-segments reddish white with dark red band in middle.

Type locality: Cosihuiriachi, Chihuahua.

Distribution: Northern Mexico.

This species was collected by Dr. A. Wislizenus in the state of Chihuahua, Mexico, about 1846. Specimens were sent to Dr. Engelmann at St. Louis, who described it in 1848 but without seeing flowers or fruit; two years afterward he described the flowers but the fruit is yet unknown. In 1894 Dr. J. M. Coulter redescribed the species, stating that it had never been recollected. Professor Schumann in his Monograph does not recognize it, but refers it to his list of doubtful species. In 1908 Dr. Rose visited the type locality and obtained a single living specimen.

Illustrations: Cact. Mex. Bound. pl. 9, f. 18 to 20, as *Mammillaria gummifera.*

8. Neomammillaria macdougalii (Rose).

Mammillaria macdougalii Rose, Stand. Cycl. Hort. Bailey *4:* 1982. 1916.

Usually low and flattened on top, but very old plants sometimes nearly globular and then 12 to 15 cm. in diameter with a carrot-shaped root; tubercles flattened dorsally, strongly angled, deep green; young areoles bearing white wool, but becoming naked in age; axils of tubercles often bearing long white wool; radial spines 10 to 12, white or somewhat yellowish, the lower ones a little stouter, brown or black at top or sometimes throughout; central spines 1 or 2, stout, yellowish, brown-tipped, similar to the radials; flowers 3.5 cm. long, cream-colored; outer perianth-segments short-fimbriate; fruit red, clavate, 3 cm. long.

Type locality: Near Tucson, Arizona.

Distribution: Southeastern Arizona.

Figure 65 is from a photograph of a plant collected by Dr. MacDougal in the Santa Catalina Mountains; figure 67 is from a photograph of another plant sent by Dr. MacDougal from the same region in November 1909.

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* Coulter writes this name *Cactus gummiferus* (Contr. U. S. Nat. Herb. *3:* 98. 1894).

9. Neomammillaria heyderi (Mühlenpfordt).

Mammillaria heyderi Mühlenpfordt, Allg. Gartenz. *16:* 20. 1848.
Cactus heyderi Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
?*Mammillaria buchheimeana* Quehl, Monatsschr. Kakteenk. *27:* 97. 1917.

Plant globose or somewhat flattened at apex; tubercles conic, 12 mm. long, when young bearing wool in their axils; young spine-areoles white-woolly; radial spines 20 to 22, white, setaceous, the lower ones stouter and longer; central spine solitary, brown at base and apex, 5 to 6 mm. long; flowers pinkish, the segments linear-oblong; fruit oblong, red.

Type locality: Not cited.

Distribution: Texas and northern Mexico.

Illustration: Schulz, Wild Fl. San Antonio pl. 13 in part, as *M. heyderi.*

Plate VIII, figure 2, shows a plant sent to Dr. Rose by Mrs. S. L. Pattison in 1921 which flowered in the New York Botanical Garden on April 21 of that year; figure 2*a* shows the fruit.

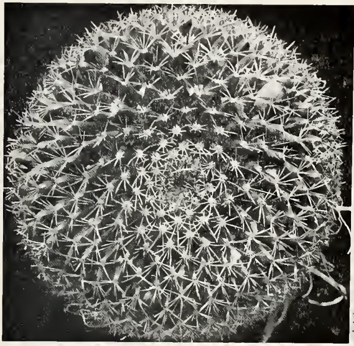


FIG. 67.—Neomammillaria macdougalii.

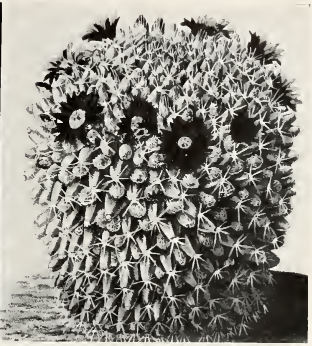


FIG. 68.—Neomammillaria phymatothele.

10. Neomammillaria hemisphaerica (Engelmann).

Mammillaria hemisphaerica Engelmann in Wislizenus, Mem. Tour North. Mex. 105. 1848.
Mammillaria heyderi hemisphaerica Engelmann, Proc. Amer. Acad. *3:* 263. 1856.
Cactus heyderi hemisphaericus Coulter, Contr. U. S. Nat. Herb. *3:* 97. 1894.
Cactus hemisphaericus Small, Fl. Southeast. U. S. 811. 1903.

Deep-seated in the soil, hemispheric, 8 to 12 cm. broad, dark green; tubercles only slightly angled, not very closely set, 1 to 1.5 cm. long, somewhat pointed, their axils nearly naked in the dormant stages; spine-areoles woolly when young, becoming glabrate in age; radial spines 9 to 13, widely spreading, acicular, the upper ones more delicate, 4 to 8 mm. long, brownish or smoky, often with black tips; central spine solitary, porrect, brown; flowers small, cream-colored, 1 to 1.5 cm. long; inner perianth-segments acute; filaments pinkish; style pinkish; stigma-lobes 6 to 10, greenish yellow; fruit slender, clavate, red, 1 to 1.5 cm. long.

Type locality: Below Matamoros on the Rio Grande.

Distribution: Southeastern Texas and northeastern Mexico.

This species was collected in 1846 by the St. Louis Volunteers in the Mexican War and taken back to Dr. George Engelmann; it flowered and he described it briefly in 1848 and in more detail in 1850. It was recently re-collected near Brownsville, Texas, just across the river from Matamoros by Robert Runyon and sent to us with a photograph taken *in situ,* here reproduced (plate VI, figure 2).

This species differs from *Neomammillaria applanata* in being less flattened and in having fewer spines and white flowers.

Cactus heyderi hemisphaericus, as treated by Coulter, must be a composite, the western and southern forms probably representing different species.

Illustrations: Cact. Mex. Bound. pl. 9, f. 15 to 17, as *Mammillaria heyderi hemisphaerica.*

Plate VIII, figure 6, shows a flowering plant from near Brownsville, Texas, collected by Robert Runyon; figure 3 shows a flowering and fruiting plant obtained by Dr. Rose at Laredo, Texas, in 1913, which flowered in the New York Botanical Garden, March 23, 1914; plate VI, figure 2, is from a photograph taken near Brownsville, Texas, by Robert Runyon in 1920.

11. Neomammillaria applanata (Engelmann).

Mammillaria applanata Engelmann in Wislizenus, Mem. Tour North. Mex. 105. 1848.
Mammillaria declivis Dietrich, Allg. Gartenz. *18:* 235. 1850.
Mammillaria texensis Labouret, Monogr. Cact. 89. 1853.
Mammillaria heyderi applanata Engelmann, Proc. Amer. Acad. *3:* 263. 1856.
Cactus texensis Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Plants much flattened; tubercles somewhat angled, their axils naked; radial spines 10 to 18, the radials widely spreading, lower ones darker brown than upper; central spine one, porrect, dark brown; young spine-areoles very woolly; flower-buds pointed, greenish; outer perianth-segments greenish, lanceolate, acuminate margins not ciliate; inner segments 2.5 cm. long, cream-colored, lanceolate, acuminate, with a broad green stripe down the middle; filaments white, shorter than the style; stigma-lobes green; fruit scarlet, naked, 2.5 to 3.5 cm. long; seeds brown.

Type locality: Rocky plains on the Pierdenales, Texas.

Distribution: Central and southern Texas.

The description is based on plants flowering in cultivation. It is one of the earliest species to flower in the spring, beginning soon after the first of March; the fruit requires a full year to mature.

Mammillaria lindheimeri Engelmann, given by Hemsley (Biol. Centr. Amer. Bot. **1:** 525. 1880) and by the Index Kewensis as a synonym of *M. texensis,* belongs here.

Neomammillaria applanata, N. heyderi, and *N. hemisphaerica* are closely related and may represent races of the same species.

Illustrations: Blanc, Cacti 66. No. 1116; Gartenflora **30:** 412; Cact. Journ. **1:** pl. for March; Meehan's Monthly **1:** 4; Balt. Cact. Journ. **1:** 138; **2:** 259; Förster, Handb. Cact. ed. 2. 333. f. 35, as *Mammillaria applanta;* Ann. Rep. Smiths. Inst. **1908:** pl. 9, f. 1; Gartenflora **29:** 52, as *Mammillaria heyderi;* Schelle, Handb. Kakteenk. 263. f. 185; Blühende Kakteen **1:** pl. 43; Cact. Mex. Bound. pl. 9, f. 4 to 14, as *Mammillaria heyderi applanata.*

Plate IX, figure 1, shows a plant in flower and fruit, collected by Dr. Rose on hills above Devil's River, Texas, in 1913, which flowered in the New York Botanical Garden, February 2, 1914.

12. Neomammillaria phymatothele (Berg).

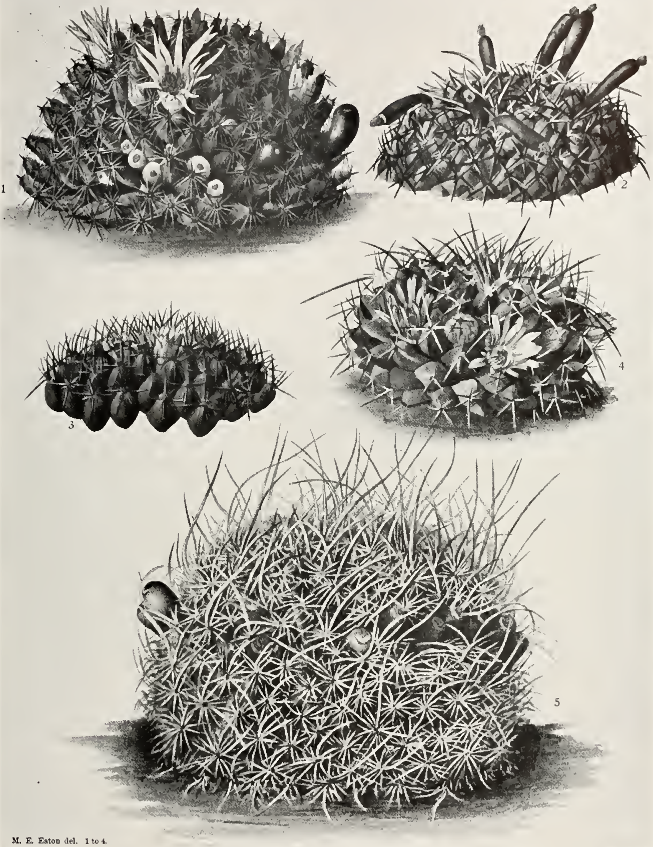
Mammillaria phymatothele Berg, Allg. Gartenz. *8:* 129. 1840.
Mammillaria ludwigii Ehrenberg, Linnaea *14:* 376. 1840.
Cactus ludwigii Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus phymatothele Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Simple, subglobose, glaucous-green; axils of young tubercles bearing white wool, becoming naked; tubercles large, 4-sided; areoles when young white-woolly, in age naked; radial spines 7 to 10, grayish white, the three upper smaller, the central (Schumann says 1 or 2) recurved; flowers described by Schumann as carmine-colored.

Type locality: Mexico.

Distribution: Central Mexico.

We know this species only from the description and illustration.



M. E. Eaton del. 1 to 4.
D. G. Passmore del. 5.

1. Flowering and fruiting plant of *Neomammillaria applanata.*
2. Top of fruiting plant of *Neomammillaria karwinskiana.*
3. Top of flowering plant of *Neomammillaria aureiceps.*
4. Flowering plant of *Neomammillaria macracantha.*
5. Fruiting plant of *Neomammillaria mystax.*

(All three-fourths size.)

Illustration: Blühende Kakteen **1**: pl. 32, as *Mammillaria centricirrha* var.

Figure 69 is from a photograph sent us by L. Quehl; figure 68 is a reproduction of the illustration cited above; figure 70 shows a plant grown in the Missouri Botanical Garden in 1905 as *Cactus neumannianus.*

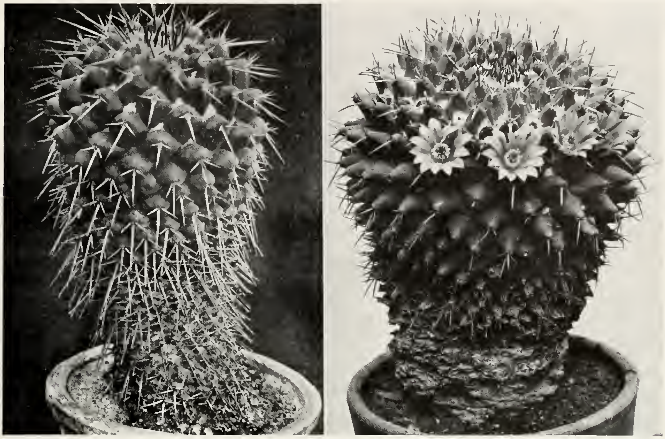


FIG. 69 and 70.—Neomammillaria phymatothele.

13. Neomammillaria magnimamma (Haworth).

Mammillaria magnimamma Haworth, Phil. Mag. *63:* 41. 1824.
Mammillaria divergens De Candolle, Mém. Mus. Hist. Nat. Paris *17:* 113. 1828.
Mammillaria gladiata Martius, Nov. Act. Nat. Cur. *16:* 336. 1832.
Mammillaria ceratophora Lehmann, Allg. Gartenz. *3:* 228. 1835.
Mammillaria recurva Lehmann in Pfeiffer, Enum. Cact. 15. 1837.
Mammillaria hystrix Martius in Pfeiffer, Enum. Cact. 21. 1837.
Mammillaria ehrenbergii Pfeiffer, Allg. Gartenz. *6:* 274. 1838.
Mammillaria microceras Lemaire, Cact. Aliq. Nov. 6. 1838.
Mammillaria deflexispina Lemaire, Cact. Aliq. Nov. 6. 1838.
Mammillaria versicolor Scheidweiler, Bull. Acad. Sci. Brux. *5:* 494. 1838.
?*Mammillaria conopsea* Scheidweiler, Bull. Acad. Sci. Brux. *5:* 496. 1838.
Mammillaria centricirrha Lemaire, Cact. Gen. Nov. Sp. 42. 1839.
Mammillaria centricirrha macrothele Lemaire, Cact. Gen. Nov. Sp. 42. 1839.
Mammillaria neumanniana Lemaire, Cact. Gen. Nov. Sp. 53. 1839.
Mammillaria conopsea longispina Scheidweiler, Bull. Acad. Sci. Brux. *6:* 92. 1839.
Mammillaria pentacantha Pfeiffer, Allg. Gartenz. *8:* 406. 1840.
Cactus magnimamma Salm-Dyck in Steudel, Nom. ed. 2. *1:* 246. 1840.
Mammillaria subcurvata Dietrich, Allg. Gartenz. *12:* 232. 1844.
Mammillaria diadema Mühlenpfordt, Allg. Gartenz. *13:* 346. 1845.
Mammillaria krameri Mühlenpfordt, Allg. Gartenz. *13:* 347. 1845.
Mammillaria foersteri Mühlenpfordt, Allg. Gartenz. *14:* 371. 1846.
?*Mammillaria tetracentra* Otto in Förster, Handb. Cact. 214. 1846.
Mammillaria bockii Förster, Allg. Gartenz. *15:* 50. 1847.
Mammillaria pazzanii Steiber, Bot. Zeit. *5:* 491. 1847.
Mammillaria divaricata Dietrich, Allg. Gartenz. *16:* 210. 1848.
Mammillaria hopferiana Linke, Allg. Gartenz. *16:* 329. 1848.
Mammillaria glauca Dietrich in Linke, Allg. Gartenz. *16:* 330. 1848.
Mammillaria centricirrha hopferiana Salm-Dyck, Cact. Hort. Dyck. 1849. 17, 123. 1850.
Mammillaria megacantha Salm-Dyck, Cact. Hort. Dyck. 1849. 123. 1850.
Mammillaria megacantha rigidior Salm-Dyck, Cact. Hort. Dyck. 1849. 18, 124. 1850.

Mammillaria uberimamma Monville in Labouret, Monogr. Cact. 120. 1853.
?*Mammillaria cirrosa*[*] Poselger, Allg. Gartenz. *21:* 94. 1853.
Mammillaria pachytele Poselger, Allg. Gartenz. *23:* 17. 1855.
Mammillaria lactescens[†] Meinshausen, Wöchenschr. Gärtn. Pflanz. *2:* 117. 1859.
Mammillaria falcata Hortus in Förster, Handb. Cact. ed. 2. 345. 1885.
Mammillaria gebweileriana Haage in Förster, Handb. Cact. ed. 2. 358. 1885.
Mammillaria schmidtii Sencke in Förster, Handb. Cact. ed. 2. 376. 1885.
Mammillaria krameri viridis Haage in Förster, Handb. Cact. ed. 2. 372. 1885.
Cactus bockii Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus centricirrhus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus conopseus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus diadema Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus divergens Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus ehrenbergii Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus foersteri Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus gladiatus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus glaucus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus krameri Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus lactescens Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus megacanthus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus microceras Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus hystrix Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus divaricatus Kuntze, Rev. Gen. Pl. *1:* 261. 1891. Not Lamarck, 1783.
Cactus neumannianus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus pazzanii Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus pentacanthus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus recurvus Kuntze, Rev. Gen. Pl. *1:* 261. 1891. Not Miller, 1768.
Cactus versicolor Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus tetracentrus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus subcurvatus Kuntze, Rev. Gen. Pl. *1:* 261.1891.
Mammillaria centricirrha magnimamma Schumann, Gesamtb. Kakteen 582. 1898.
Mammillaria centricirrha divergens Schumann, Gesamtb. Kakteen 582. 1898.
Mammillaria centricirrha bockii Schumann, Gesamtb. Kakteen 582. 1898.
Mammillaria centricirrha recurva Schumann, Gesamtb. Kakteen 582. 1898.
Mammillaria centricirrha krameri Schumann, Gesamtb. Kakteen 582. 1898.

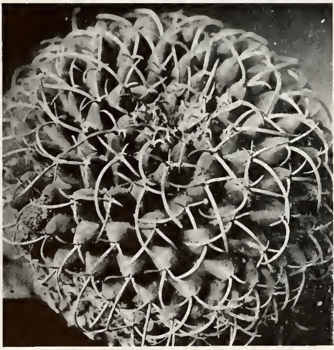


Fig. 71.—Neomammillaria magnimamma.

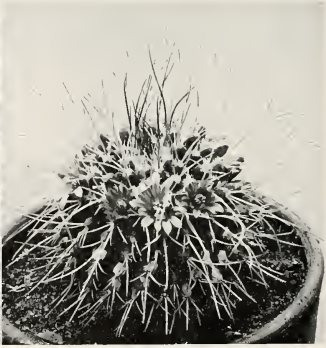


Fig. 72—Neomammillaria macracantha.

Globose, the larger plants 10 cm. in diameter, sometimes solitary but oftener cespitose with 25 in a cluster or more, very milky throughout; tubercles conic or somewhat flattened or faintly 4-angled, 1 cm. long, the axils when young densely woolly; spines 3 to 5, very unequal in length, the upper ones short and straight, the lower one or two 1.5 to 4.5 cm. long, recurved or incurved, all horn-colored, with black tips; flowers cream-colored; fruit clavate, 2 cm. long, crimson; seeds brownish.

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[*] Schumann refers *Mammillaria cirrosa* (he spells it *M. cirrhosa*) doubtfully to *M. centricirrha,* but judging from the description it may belong elsewhere.

[†] Here was referred *M. neumanni glabrescens* Regel (Förster, Handb. Cact. ed. 2. 370. 1885).

Type locality: Not cited.

Distribution: Central Mexico.

This plant is very common in central Mexico, especially in the Valley of Mexico, about Tula, farther north, and also east of the City of Mexico. It makes large cespitose mounds, sometimes with many-headed branches, and has peculiar incurved spines and small flowers. It is frequently collected and has been shipped abundantly to Europe, where it has been much named, often from single joints. Our synonymy shows 34 specific names under *Mammillaria* and nearly as many under *Cactus*. Some writers have given these names varietal rank, so that this species now has about 100 names. It is a very characteristic plant and, while it may easily be confused with other species, yet, when clearly understood, its distinctness is evident.

Mammillaria zooderi was referred by Schumann (Gesamtb. Kakteen 582. 1898) as a synonym of *M. centricirrha* but the Index Kewensis Suppl. 5. cites Schelle (Handb. Kakteenk. 268. 1907), who gives it as a synonym of *M. centricirrha zooderi.* Neither the specific nor the varietal name can be considered published.

Schelle (Handb. Kakteenk. 266 to 268. 1907) lists 62 varietal names of *Mammillaria centricirrha,* all but one or two of which are based on species of the same name. Some of these perhaps are to be referred elsewhere, but we have listed them here as follows:

amoena
arietina
bockii
boucheana
ceratophora
cirrhosa
conopsea
cristata
deflexispina
destorum
de tampico
diacantha
diadema
divaricata
divergens
ehrenbergii
falcata
foersteri
gebweileriana
gladiata
glauca
globosa
grandidens
guilleminiana
hopfferiana
hystrix
hystrix grandicornis
hystrix longispina
jorderi
krameri
krameri longispina
krausei
lactescens
lehmannii
longispina
macracantha
magnimamma
megacantha
microsceras
montsii
moritziana
neumanniana
nordmannii
obconella
pachythele
pazzanii
pentacantha
polygona
posteriana
pulchra
recurva
schiedeana
schmidtii
spinosior
subcurvata
tetracantha
uberimamma
valida
versicolor
viridis
zooderi
zuccariniana

The following garden names are listed by Schumann (Gesamtb. Kakteen 582. 1898) as belonging to this species:

boucheana
destorum
de tampico
grandicornis
grandidens
hystrix
jorderi
lehmannii
longispina
montsii
moritziana
nordmannii
obconella
posteriana
spinosior
tetracantha
viridis
zooderi

Illustrations: Hort. Belge **5:** pl. 6, as *Mammillaria conopsea;* Reiche, Elem. Bot. f. 166, as *M. centricirrha.* Schelle's figure (Handb. Kakteenk. 268. f. 189) we are not able to place. The illustration in Blühende Kakteen (**1:** pl. 32) as *M. centricirrha* var. does not seem to be of this relationship.

Plate XI, figure 1, shows a small potted plant which flowered in the New York Botanical Garden, May 6, 1913. Figure 71 is from a photograph of a plant obtained on the pedregal near San Angel, Valley of Mexico, by O. Solis in 1919.

14. Neomammillaria macracantha (De Candolle).

Mammillaria macracantha De Candolle, Mém. Mus. Hist. Nat. Paris *17:* 113. 1828.
Cactus macracanthus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus alternatus Coulter, Contr. U. S. Nat. Herb. *3:* 95. 1894.
Mammillaria centricirrha macracantha Schumann, Gesamtb. Kakteen 582. 1898.

Depressed-globose, 2 to 3 cm. high, 6 to 15 cm. in diameter; axils of old tubercles naked, of young ones densely lanate; tubercles ovoid, somewhat 4-sided; young spine-areoles somewhat tomentose; spines 1 or 2, somewhat angled, elongated, the longest 5 cm. long (but not elongated in greenhouse specimens), porrect or more or less reflexed, reddish in age; flowers dark pink, a little longer than the tubercles; perianth-segments linear, spreading; stigma-lobes 5 to 7, rose-colored.

Type locality: Mexico.

Distribution: San Luis Potosí.

Our description is based on plants from San Luis Potosí, Mexico, especially those collected by Mrs. Vera in 1912.

Schumann refers *Mammillaria macracantha* to *M. centricirrha* but it must be different. Rümpler refers to it also *M. zuccarinii,* but this has different flowers and we have recognized it as a species. *M. macrantha* (Förster, Handb. Cact. 189. 1894) is referred here.

Illustrations: De Candolle, Mém. Cact. pl. 9; Förster, Handb. Cact. ed. 2. 378. f. 38, as *Mammillaria macracantha;* Schumann, Gesamtb. Kakteen f. 93; Thomas, Zimmerkultur Kakteen 57; Möllers Deutsche Gärt. Zeit. **25:** 475. f. 8, No. 13, as *M. centricirrha macracantha;* (?) Engler and Prantl, Pflamzenfam. 3^{6a}: 170. f. 57, E, as *M. centricirrha.*

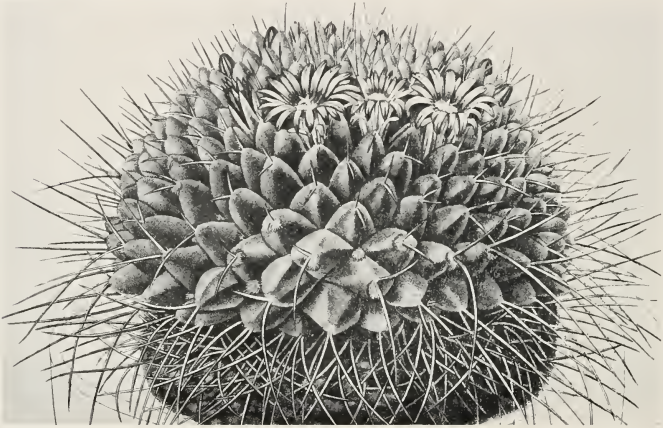
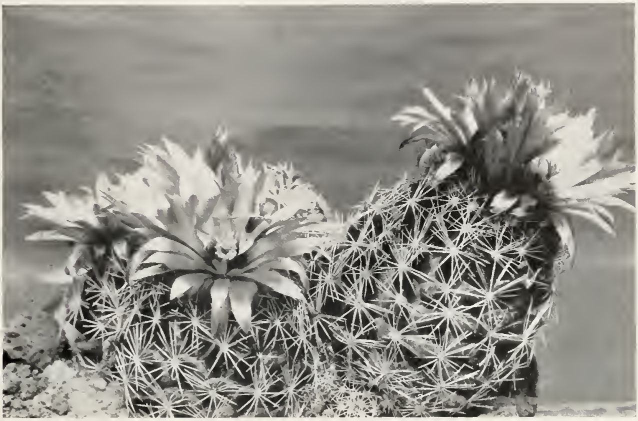


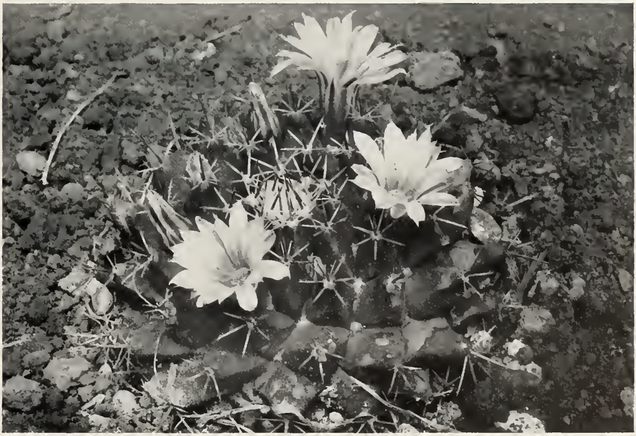
Fig. 72*a*.—Neomammillaria macracantha.

Plate IX, figure 4, shows a plant received from Kew in 1902, which flowered in the New York Botanical Garden on April 27, 1912. Figure 72*a* is a reproduction of the first illustration cited above; figure 72 is from a photograph of the plant distributed by the Kew Gardens in 1902 which flowered in the New York Botanical Garden in 1905.

15. Neomammillaria johnstonii sp. nov.

Plants large for the genus, globular to short-oblong, 15 to 20 cm. high, slightly depressed at apex; tubercles 1 to 1.5 cm. long, 4-angled throughout, somewhat bluish, naked in their axils, milky; spine-areoles when young short-floccose, in age glabrate, circular; radial spines 10 to 14, white, but with brown tips, somewhat spreading, stiff-acicular; central spines 2, much longer and stouter than the radials, slightly diverging, bluish brown; flowers from near top of plant but from axils of old tubercles, campanulate, 2 cm. long; outer perianth-segments ovate-lanceolate, greenish white with a reddish-brown mid-rib; inner perianth-segments narrow, acuminate, white; filaments short, pinkish; style pinkish; stigma-lobes linear, 6 or 7, green.





Coryphantha sulcata, from Sabinal, Texas.
Neomammillaria runyonii, from Monterey, Mexico.

Collected at San Carlos Bay, Sonora, Mexico, by Ivan M. Johnston in 1921 (No. 4373) and flowered in Washington in April 1922 and April 1923.

Figure 72*b* is from a photograph of the type specimen.

16. Neomammillaria melanocentra (Poselger).

Mammillaria melanocentra Poselger, Allg. Gartenz. *23:* 17. 1855.
Mammillaria erinacea Poselger, Allg. Gartenz. *23:* 18. 1855.
Mammillaria valida Weber, Dict. Hort. Bois 806. 1898.

Short-cylindric, glaucous-green; tubercles in 8 and 13 spirals, strongly angled; radial spines 6, stout-subulate, 1.5 to 2 cm. long, brownish; central spines solitary, black, 2 to 3 cm. long, greatly overtopping the stem; flowers pinkish red, the segments linear, acute.

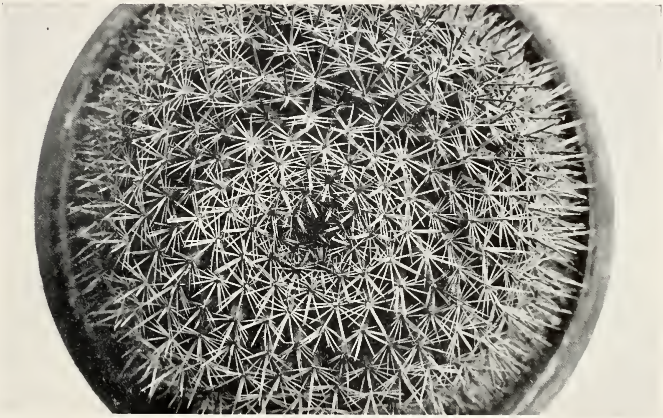


FIG. 72*b*.—Neomammillaria johnstonii.

Type locality: Near Monterey, Mexico.

Distribution: Mexico, but range unknown.

Illustration: Blühende Kakteen **3:** pl. 129, as *Mammillaria melanocentra.*

Figure 73 is a reproduction of the illustration cited above.

17. Neomammillaria runyonii sp. nov.

Plants deep-seated, depressed; tubercles milky, elongated, 1.5 cm. long, strongly 4-angled, their tips widely separated from each other, their axils long-wooly (never setose), especially when young, sometimes permanently so; young spine-areoles long-woolly, but in age glabrate; radial spines 6 to 8, slightly ascending, the outer ones stouter and often dark brown in color, the inner ones about half the length of the outer and nearly white; central spine solitary, brown to black, erect, 10 to 14 mm. long; flowers about 2 cm. long, purple; perianth-segments oblong; fruit red, clavate, 12 to 16 mm. long; seeds brown.

Collected on El Mirador, near Monterey, Mexico, by Robert Runyon in 1921.

Plate x, figure 2, is from a photograph of one of the plants Mr. Runyon originally brought from El Mirador.

18. Neomammillaria sartorii (J. A. Purpus).

Mammillaria sartorii J. A. Purpus, Monatsschr. Kakteenk. *21:* 50. 1911.

Globose to short-cylindric, 5 to 13 cm. in diameter, cespitose, very milky, bluish green; tubercles strongly 4-angled, pointed, 8 to 12 mm. long, their axils without bristles and in time without wool; spine-areoles circular when young, densely white-woolly but in age glabrate; spines 4 to 6, very unequal, 5 to 8 mm. long, whitish or sometimes brownish, the central spine solitary; flowers 1.5 to about 2 cm. long, deep carmine; perianth-segments oblong, apiculate, the tip dry, the outer ciliate, the inner serrulate; stamens and style purplish above; stigma-lobes 4, purple, short; fruit carmine; seeds brown.

Type locality: Barranca de Panoaya, Vera Cruz, Mexico.

Distribution: Mountains of Vera Cruz, 300 to 600 meters altitude.

Our description of this interesting and variable little plant is drawn from specimens sent to us by Dr. C. A. Purpus in 1920, collected at the type locality. There the plant grows among rocks in rich humus of the decaying leaves in half shade or in the sun. It is very different from any other *Neomammillaria* which we have seen; the tubercles are copiously milky and the slightest bruise causes the white milk to ooze out. It flowered in Washington in April 1923.

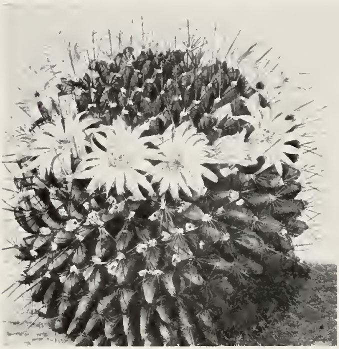


Fig. 73.—Neomammillaria melanocentra.

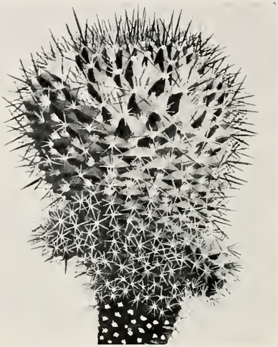


Fig. 74.—Neomammillaria seitziana.

Dr. C. A. Purpus writes that this species is common in many of the barrancas of Vera Cruz and that it is very variable. When first described two forms (*brevispina* and *longispina*) were characterized.

The species was named for Florantino Sartorius (1837-1908) who assisted Dr. Purpus for many years in his botanical expeditions. He was a son of Carlos Sartorius (1795-1872), a distinguished scientist who went to Mexico about 1825, where he made large collections of plants. Mr. W. Botting Hemsley (Biol. Centr. Amer. Bot. 4: 123) states that his herbarium was left to the Smithsonian Institution, but no record of this gift can now be found nor can any of his plants be found in the U. S. National Herbarium.

Here may or may not belong *Mammillaria rebsamiana* (Cact. Journ. 2: 176), advertised as a new discovery by Louis Murillo, who lived at Jalapa, Mexico.

Illustration: Monatsschr. Kakteenk. 21: 51, as *Mammillaria sartorii.*

Figure 75 is from a photograph showing two plants sent from the type locality of *Mammillaria sartorii* by Dr. Purpus in 1920.

19. Neomammillaria seitziana (Martius).

Mammillaria seitziana Martius in Pfeiffer, Enum. Cact. 18. 1837.
Mammillaria foveolata Mühlenpfordt, Allg. Gartenz. *14:* 372. 1846.
Cactus fovelatus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus seitzianus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Solitary or somewhat proliferous at base, cylindric, 12 cm. high; tubercles green, conic, somewhat angled; axils of tubercles woolly; areoles at first white-woolly, becoming glabrate; spines 4,* the upper and lower longer than the lateral; flowers rose-colored, about 25 mm. long; outer perianth-segments olive colored; inner perianth-segments linear, lanceolate, white, nerved with red; stamens white; stigma-lobes 6.

Distribution: State of Hidalgo.

Type locality: Ixmiquilpan, Mexico.

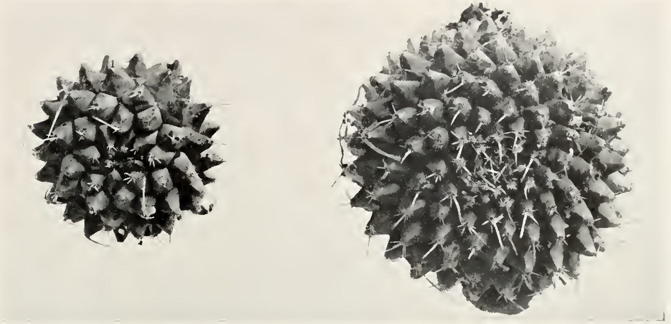


FIG. 75.—Neomammillaria sartorii.

We have not seen this species and hence our description is compiled.

Mammillaria senckena and *M. senckei* are two names listed as synonyms of this species, but we do not find that they have ever been published.

Illustration: Pfeiffer and Otto, Abbild. Beschr. Cact. **1**: pl. 8, as *Mammillaria seitziana.*

Figure 74 is reproduced from the illustration cited above.

20. Neomammillaria ortegae sp. nov.

Simple to short-clavate, 5 to 8 cm. in diameter, light green, lactiferous; tubercles rather short (8 to 10 mm. long), broader at base, obscurely 4-angled, somewhat pointed, very woolly but not setose in their axils; spines all radial, 3 or 4, more commonly 4 (sometimes with 1 or 2 small additional spines or bristles, perhaps deciduous), spreading, straw-colored, 6 to 10 mm. long; flowers small; fruit clavate, 1 cm. long; seeds numerous, small, angled, brown.

Collected by J. G. Ortega in Sinaloa, Mexico, in 1921 and 1922.

Figure 76 shows the type specimens as photographed in the U. S. National Museum under the direction of A. J. Olmstead.

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* Schumann says central spines yellow.

21. Neomammillaria meiacantha (Engelmann).

Mammillaria meiacantha Engelmann, Proc. Amer. Acad. *3:* 263. 1856.
Cactus meiacanthus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

Somewhat depressed, 12 cm. broad or more; tubercles milky, bluish green, more or less angled, somewhat flattened dorsally, their axils naked; spines 5 to 9, ascending, pale flesh-colored, the tips darker, the lower a little stouter than the upper; central spines porrect, similar to but a little stouter than radials and often subradial; spine-areoles short-woolly at first; flowers not very abundant, at least on cultivated plants; inner perianth-segments white with a pink stripe along inside of midrib, one-fourth its width, greenish brown on outside; filaments white; style pink; stigma-lobes yellow; fruit scarlet, 22 mm. long; seeds brownish.

Type locality: Western Texas and New Mexico.

Distribution: Texas, New Mexico, and northern Mexico.

According to Dr. Engelmann, this species was first obtained in New Mexico by the Missouri Volunteers in 1847 and it has frequently been collected since that time. In Mexico it extends as far south as Zacatecas, but develops into some unusual forms. It was repeatedly collected in Zacatecas by F. E. Lloyd in 1908.

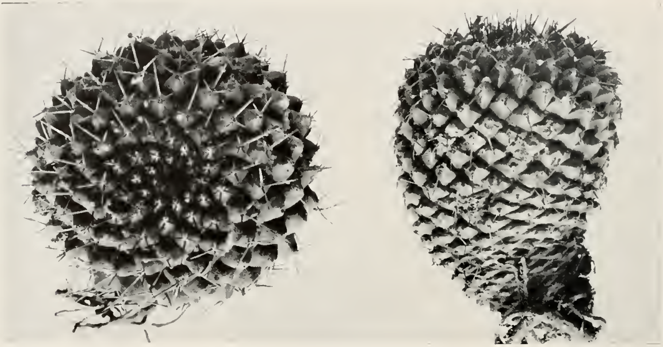

FIG. 76.—Neomammillaria ortegae.

Illustrations: Blühende Kakteen **1:** pl. 47*; Blanc, Cacti 71. No. 1388; Cycl. Amer. Hort. Bailey **2:** f. 1357; Stand. Cycl. Hort. Bailey **4:** f. 2316; West Amer. Sci. **13:** 39; Schelle, Handb. Kakteenk. 258. f. 190; Cact. Mex. Bound. pl. 9, f. 1 to 3; Cact. Journ. **1:** pl. for October, as *Mammillaria meiacantha.*

Figure 77 shows the plant illustrated in the Mexican Boundary Report as cited above.

22. Neomammillaria scrippsiana sp. nov.

Globose or becoming short-cylindric, 6 cm. high; tubercles milky, in 26 rows, bluish green, very woolly in axils when young; spine-areoles very woolly at first; radial spines 8 to 10, slender, pale with reddish tips; central spines generally 2, a little longer than radials, brown throughout, slightly divergent; flowers borne near top of plant but not in axils of youngest tubercles, about 1 cm. long, pinkish, with margins of perianth-segments paler; anthers pinkish; stigma-lobes about 6, recurved, cream-colored.

Collected by Dr. Rose in the barranca of Guadalajara, Jalisco, in September 1903 (No. 871, type). The plant has flowered repeatedly in Washington since April 1906. Specimens were afterward collected near the same place by C. R. Orcutt. It is named in honor of E. W.

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* This plate is labeled *Mammillaria meionacantha,* but described under *M. meonacantha.*

Scripps, the founder of Science Service and The Scripps Institution for Biological Research of the University of California.

Figure 78 is from a photograph of the type specimen.

23. Neomammillaria gigantea (Hildmann).

Mammillaria gigantea Hildmann in Schumann, Gesamtb. Kakteen 578. 1898.

Solitary or cespitose, depressed-globose, 10 cm. high, 15 to 17 cm. in diameter; axils of tubercles lanate; radial spines 12, subulate, white, 3 mm. long; central spines 4 to 6, stout, 2 cm. long, curved, yellowish brown; flowers yellowish green.

Type locality: Guanajuato, Mexico.

Distribution: Known only from the type locality.

Mammillaria macdowellii Heese and *M. guanajuatensis* Rünge are two names referred here by Schumann (Gesamtb. Kakteen 578. 1898), but they were not published.

Plate XI, figure 3, shows a plant in fruit, collected by Dr. Safford at the type locality.

24. Neomammillaria peninsularis sp. nov.

Plants solitary or in clusters, deeply seated in the ground, more or less flat-topped, bluish green, the stems and tubercles very milky; tubercles erect, pointed, 4-angled, pale green; radial spines 4 to 8, nearly erect, short and pale with brown tips, one sometimes nearly central; axils of tubercles bearing long wool but in age naked; flowers 1.5 cm. long, arising from old tubercles but near the center; outer perianth-segments narrow, reddish; inner perianth-segments narrow, acuminate, green or light yellow with erose margins; stamens pale; style longer than stamens; stigma-lobes green, linear.

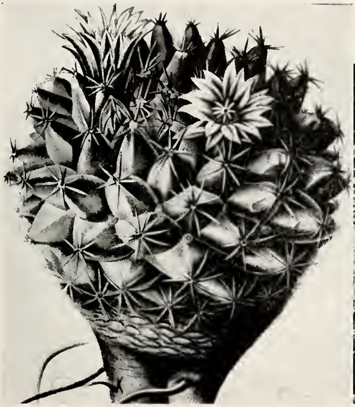

FIG. 77.—Neomammillaria meiacantha.

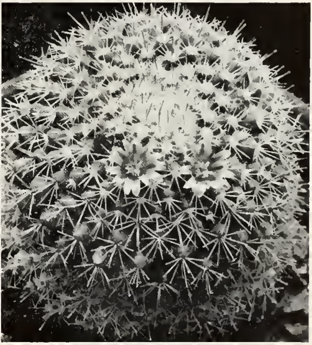

FIG. 78.—Neomammillaria scrippsiana.

Collected by Dr. Rose at Cape San Lucas, Lower California, March 23, 1911 (No. 16377).

25. Neomammillaria flavovirens (Salm-Dyck).

Mammillaria flavovirens Salm-Dyck, Cact. Hort. Dyck. 1849. 117. 1850.

Either solitary or somewhat cespitose, globose or short-cylindric, 6 to 8 cm. high, light or yellowish green; tubercles somewhat 4-angled; axils naked; radial spines 5, slender, subulate; central spines solitary, porrect; flowers white, streaked with rose.

Type locality: Not cited.

Distribution: Mexico.

The above description is compiled, since the species is not otherwise known to us.

Mammillaria flavovirens cristata Salm-Dyck (Cact. Hort. Dyck. 1849. 16. 1850) is only a name.

The name *Mammillaria daedalea viridis* Fennel is given by Labouret (Monogr. Cact. 100. 1853) as a synonym of *M. flavovirens.*

26. Neomammillaria sempervivi (De Candolle).

Mammillaria sempervivi De Candolle, Mém. Mus. Hist. Nat. Paris *17:* 114. 1828.
Mammillaria sempervivi tetracantha De Candolle, Mém. Mus. Hist. Nat. Paris *17:* 114. 1828.
Mammillaria caput-medusae Otto in Pfeiffer, Enum. Cact. 22. 1837.
Mammillaria diacantha Lemaire, Cact. Aliq. Nov. 2. 1838.
Mammillaria sempervivi laeteviridis Salm-Dyck, Cact. Hort. Dyck. 1849. 113. 1850.
Mammillaria caput-medusae centrispina Salm-Dyck in Labouret, Monogr. Cact. 91. 1853.
Mammillaria caput-medusae crassior Salm-Dyck in Labouret, Monogr .Cact. 91. 1853.
Mammillaria caput-medusae tetracantha Salm-Dyck in Labouret, Monogr. Cact. 91. 1853.
Cactus sempervivi Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

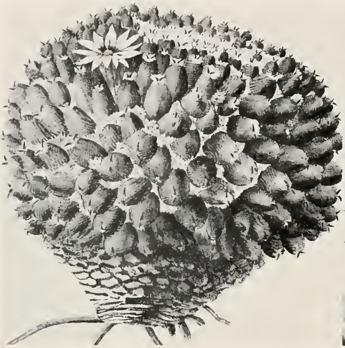

FIG. 79.—Neomammillaria sempervivi.

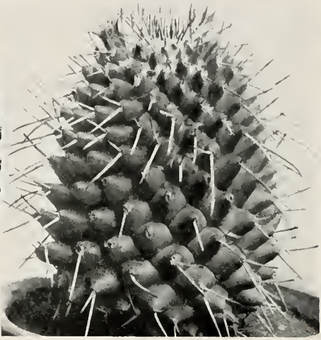

FIG. 80.—Neomammillaria polythele.

Solitary or somewhat cespitose, flattened above, narrowed below; axils of tubercles very woolly; tubercles short, milky, angled; spine-areoles very woolly when young, but glabrate in age; radial spines 3 to 7, short, white, caducous; central spines 2, ascending, brownish, stoutish; flowers dull white with reddish lines; inner perianth-segments acute, spreading.

Type locality: Mexico.

Distribution: Central Mexico.

Dr. Rose collected what he took to be this species in the Barranca Sierra de la Mesa, Hidalgo, Mexico, in 1905, but this plant differs somewhat from De Candolle's illustration. The central spines, while generally 2, are sometimes 3 and are not so stout; the radial spines are deciduous, as they should be in this species. It flowered once at Washington.

An examination of the original description of *Mammillaria caput-medusae* suggests the probability that this species is identical with *Mammillaria sempervivi.* The two names appeared in collections in 1829 and may have come from a common source. Indeed, Schumann credits T. Coulter with having obtained *M. caput-medusae.* while we know that *M. sempervivi* was based on Coulter's plant and, then, too, Pfeiffer refers *M. sempervivi* as a synonym of *M. caput-medusae. Knippel's illustration of M. caput-medusae* (pl. 19) seems to be referable here. Nicholson states that *M. caput-medusae* is only a form of this species.

Mammillaria staurotypa (Förster, Handb. Cact. 221. 1846), credited to Scheidweiler by Schumann and referred by him as a synonym of *M. caput-medusae,* seems never to have been described but may belong here.

The two varieties of *Mammillaria caput-medusae, tetracantha* and *hexacantha,* given by Salm-Dyck (Cact. Hort. Dyck. 1844. 10. 1845) are without description. The first was afterwards described by Labouret.

Illustrations: De Candolle, Mém. Cact. pl. 8; Förster, Handb. Cact. ed. 2. 344. f. 36; Schumann, Gesamtb. Kakteen 589. f. 95; Dict. Gard. Nicholson 4: 565. f. 38; Suppl. 518. f. 556; Watson, Cact. Cult. 175. f. 70, as *Mammillaria sempervivi;* Schelle, Handb. Kakteenk. 270. f. 192; Succulenta 5: 51, as *M. caput-medusae.*

Figure 79 is a reproduction of the first illustration cited above.

27. Neomammillaria obscura (Hildmann).

Mammillaria obscura Hildmann, Monatsschr. Kakteenk. *1:* 52. 1891.

Solitary, depressed-globose, blackish green; axils woolly; tubercles arranged in 13 and 21 spirals, angled, stout, woolly in their axils but not setose; radial spines 6 to 8, subulate, white, unequal, the upper ones shorter than the lower; central spines 2 to 4, the lower one slightly curved, black; flowers small, yellowish white.

Type locality: Mexico.

Distribution: Mexico, but range unknown.

The plant is known to us only from description and illustration.

Seeds of this species were introduced into Germany from Mexico about 1885 by Mr. Droege and flowers were obtained in 1891.

The earlier name, *Mammillaria obscura* Scheidweiler (Förster, Handb. Cact. 213. 1846), but used only as a synonym and for some other plant, does not interfere with our present use of the name.

Illustration: Monatsschr. Kakteenk. **1:** facing 52, as *Mammillaria obscura.*

28. Neomammillaria crocidata (Lemaire).

Mammillaria crocidata Lemaire, Cact. Aliq. Nov. 9. 1838.
Mammillaria webbiana Lemaire, Cact. Gen. Nov. Sp. 45. 1839.
Cactus crocidatus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus webbianus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Plant globose or a little depressed, 5 to 6 cm. in diameter; radial spines 6 or 7, dark brown or nearly black; central spines none; axils of tubercles in young plant densely woolly; flowers from axils of old tubercles near the top of plant, small, reddish purple, 12 to 14 mm. long; outer perianth-segments ciliate; inner perianth-segments acuminate; filaments, style, and stigma-lobes reddish; stigma-lobes 3 or 4; fruit not seen.

Type locality: Mexico.

Distribution: Central Mexico.

Described here from plants collected by Dr. Rose near Querétaro, Mexico, in 1906, which flowered in August and September 1908, and again in April 1909 (No. 1072). Our specimen has more spines than the original *M. crocidata*; it is also near *M. carnea* but with different colored stigma-lobes; its tubercles are about 6 mm. high.

Schumann places this species near *M. carnea* and among the cylindric species, but it was originally described as depressed.

Mammillaria croidata quadrispina Pfeiffer and Salm-Dyck, mentioned by Förster (Handb. Cact. 220. 1846) as a rare form and afterwards briefly described by Labouret (Monogr. Cact. 93. 1853), may or may not belong here.

Plate VII, figure 5, shows a flowering plant collected by Dr. Rose in Querétaro in 1906 and painted in the New York Botanical Garden, September 5, 1911.

29. Neommmillaria polythele (Martius).

Mammillaria polythele Martius, Nov. Act. Nat. Cur. *16:* 328. 1832.
Mammillaria quadrispina Martius, Nov. Act. Nat. Cur. *16:* 329. 1832.
Mammillaria columnaris Martius, Nov. Act. Nat. Cur. *16:* 330. 1832.
Mammillaria affinis De Candolle, Mém. Cact. 11. 1834.
Mammillaria setosa Pfeiffer, Allg. Gartenz. *3:* 379. 1835.
Mammillaria polythele quadrispina Salm-Dyck. in Walpers, Repert. Bot. *2:* 271. 1843.
Mammillaria polythele columnaris Salm-Dyck in Walpers, Repert. Bot. *2:* 271. 1843.
Mammillaria polythele setosa Salm-Dyck, Cact. Hort. Dyck. 1844. 9. 1845.
Mammillaria polythele hexacantha Salm-Dyck, Cact. Hort. Dyck. 1849. 15. 1850.
Mammillaria polythele latimamma Salm-Dyck, Cact. Hort. Dyck. 1849. 112. 1850.
Cactus affinis Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus quadrispinus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus setosus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus polythele Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
?*Mammillaria hidalgensis* Purpus, Monatsschr. Kakteenk. *17:* 118. 1907.

Elongated, cylindric, often 3 to 5 dm. high, 7 to 10 cm. in diameter; tubercles milky, in about 21 spirals, 10 to 12 mm. long, nearly terete, somewhat narrowed toward apex, dull green; axils of young tubercles densely long-woolly, the wool nearly covering the top of the plant, in age becoming naked; spines 2 to 4, sometimes 6, all radial, somewhat spreading, 1 to 2.5 cm. long, reddish, straight or a little curved; flowers from near top of plant, reddish, 8 to 10 mm. long; perianth-segments narrow, acuminate; fruit red, clavate; seeds small, brownish.

Type locality: Mexico.

Distribution: State of Hidalgo.

In 1905 Dr. Rose collected living plants of this species near Ixmiquilpan. It is a rather striking plant, growing very tall and flowering near the top.

Schumann places this species in the Section *Hydrochylus*, in which the sap is watery, but Martius in his original description says definitely that it is milky.

Mammillaria aciculata Otto (Pfeiffer, Enum. Cact. 29. 1837; *M. polythele aciculata* Salm-Dyck, Cact. Hort. Dyck. 1844. 9. 1845) is referred here by Schumann but should be excluded; it came from the cold regions of Mexico and was described as having 20 white slender radial spines.

Mammillaria columnaris minor Martius and *M. quadrispina major*, mentioned by Förster (Handb. Cact. 214, 215. 1846), probably belong here.

Mammillaria cataphracta Martius was given by Pfeiffer (Enum. Cact. 11. 1837) as a synonym of *M. affinis* and by Salm-Dyck (Hort. Dyck. 155. 1834) as a synonym of *M. angularis*.

Illustrations: Nov. Act. Nat. Cur. **16:** pl. 19, as *Mammillaria polythele;* Monatsschr. Kakteenk. 17: 119; Möllers Deutsche Gärt. Zeit. **25:** 475. f. 8, No. 10, as *M. hidalgensis;* De Candolle, Mém. Cact. pl. 6, as *M. affinis;* Abh. Bayer. Akad. Wiss. München **2:** pl. 1, I. f. 2, as *M. columnaris.*

Figure 80 is from a photograph of a plant collected in the state of Hidalgo in 1905 which has heretofore passed as *Mammillaria hidalgensis.*

30. Neomammillaria carnea (Zuccarini).

Mammillaria carnea Zuccarini in Pfeiffer, Enum. Cact. 19. 1837.
Mammillaria subtetragona Dietrich, Allg. Gartenz. *8:* 169. 1840.
Mammillaria aeruginosa Scheidweiler, Allg. Gartenz. *8:* 338. 1840.
Mammillaria pallescens Scheidweiler, Allg. Gartenz. *9:* 42. 1841.
Mammillaria villifera carnea Salm-Dyck, Cact. Hort. Dyck. 1849. 16. 1850.
Mammillaria villifera aeruginosa Salm-Dyck. Hort. Dyck. 1849. 16. 1850.
Mammillaria villifera cirrosa * Salm-Dyck, Cact. Hort. Dyck. 1849. 115. 1850.
Cactus aeruginosus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus carneus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus pallescens Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus subtetragonus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Mammillaria carnea cirrosa Gürke, Blühende Kakteen *1:* under pl. 60. 1905.
Mammillaria carnea aeruginosa Gürke, Blühende Kakteen *1:* under pl. 60. 1905.

Plants solitary, cylindric, 8 to 9 cm. high; tubercles 4-angled, milky, their axils woolly, the upper ones erect; spines 4, straight, reddish, the lower one 10 mm. long, twice as long as the other 3; flowers borne in the old axils; outer perianth-segments nearly 2 cm. long, nearly erect, flesh-colored; fruit pear-shaped, obtuse, bright red.

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* Förster (Handb. Cact. ed. 2. 342. 1885) spells this name, *cirrhosa*.

Type locality: Ixmiquilpan, Mexico.

Distribution: Central and southern Mexico.

Mammillaria villifera Otto, referred here by Schumann, must belong elsewhere, since the axils of the tubercles bear setae.

Illustrations: Blühende Kakteen **1**: pl. 60; Monatsschr. Kakteenk. **28**: 59; Schelle, Handbk. Kakteenk. 271. f. 193, as *Mammillaria carnea.*

Plate VII, figure 7, shows a plant collected by Dr. Rose at Tehuacán in 1906, which flowered in the New York Botanical Garden, May 4, 1912. Figure 81 is from a photograph of a plant collected by Dr. Rose at Tehuacán in 1905.

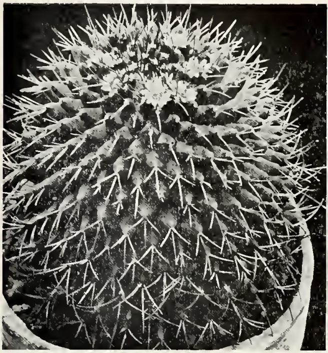


FIG. 81.—Neomammillaria carnea.

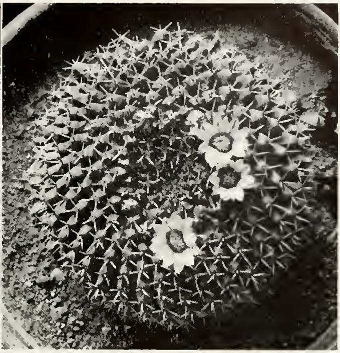


FIG. 82.—Neomammillaria lloydii.

31. **Neomammillaria lloydii** sp. nov.

Plant-body at first flattened but in cultivation becoming elongated, sometimes 10 cm. long, 6 to 7 cm. in diameter; axils of young tubercles only slightly woolly; tubercles milky, small, numerous, 4-angled, woolly when quite young; radial spines 3 or 4, ascending, glabrous, the uppermost one red or dark brown, the others whitish, 2 to 5 mm. long; central spines none; flowers in a ring near center of plant; outer perianth-segments dark red with light or colored margins; inner perianth-segments white with a tinge of red, and dark-red central stripes, not ciliate, apiculate, spreading above; filaments pale below, pinkish above; style pinkish above.

Collected by F. E. Lloyd in the State of Zacatecas, Mexico, in 1909, and flowered in Washington in 1911, 1912 (March), and 1915 (April).

Figure 82 is from a photograph of the type plant (Lloyd, No. 55).

32. **Neomammillaria zuccariniana** (Martius).

Mammillaria zuccariniana Martius, Nov. Act. Nat. Cur. *16:* 331. 1832.

Globose to elongated-cylindric, 8 to 20 cm. long, bluish green, milky; areoles and axils of young tubercles filled with white wool; radial spines wanting or represented by very stout bristles; central spines 2 to 4, black, unequal, 2 to 12 mm. long, spreading; flowers about 1 cm. long, with a broad open throat; outer perianth-segments brownish, acute; inner perianth-segments lanceolate, acute, entire, magenta-colored; filaments purplish; stigma-lobes 3 or 4, purplish, broad, truncate; fruit red, 10 mm. long; seeds brownish.

Type locality: Mexico.

Distribution: San Luis Potosí, Mexico.

We have had this plant in cultivation for a number of years; Dr. E. Palmer obtained it near San Luis Potosí in 1905 (No. 590); it was also collected by Mrs. Vera from the same locality in 1912.

Illustration: Martius, Nov. Act. Nat. Cur. **16:** pl. 20, as *Mammillaria zuccariniana.*

Figure 83 is from a photograph of a plant collected by Dr. E. Palmer near Alvarez, San Luis Potosí, May 1905, which afterwards flowered in Washington, D. C.

33. Neomammillaria formosa (Galeotti).

Mammillaria formosa Galeotti in Scheidweiler, Bull. Acad. Sci. Brux. *5:* 497. 1838.
Mammillaria formosa microthele Salm-Dyck, Cact. Hort. Dyck. 1849. 87. 1850.
Mammillaria formosa dispicula Monville in Labouret, Monogr. Cact. 60. 1853.
Mammillaria formosa gracilispina Monville in Labouret, Monogr. Cact. 60. 1853.
Mammillaria formosa laevior Monville in Labouret, Monogr. Cact. 60. 1853.
Cactus formosus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

Somewhat clavate, sunken at the apex; axils lanate; tubercles spirally arranged, obtusely 4-angled, light green; areoles naked; radial spines 20 to 22, white, rigid, radiating; central spines 6, spreading, thickened at base, at first flesh-colored at base, black at tip, becoming black throughout or grayish; flowers red.

Type locality: Near San Felipe.

Distribution: San Luis Potosí, Mexico, according to Hemsley.

Dr. Safford has referred here a plant collected by Dr. E. Palmer at San Luis Potosí which may be the plant which is passing under this name, but it does not seem to answer the original descriptions.

Illustration: Garten-Zeitung **4:** 182. f. 42, No. 11, as *Mammillaria formosa.*

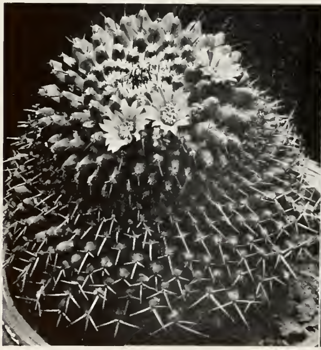


FIG. 83.—Neomammillaria zuccariniana.

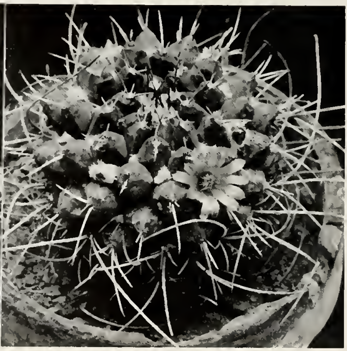


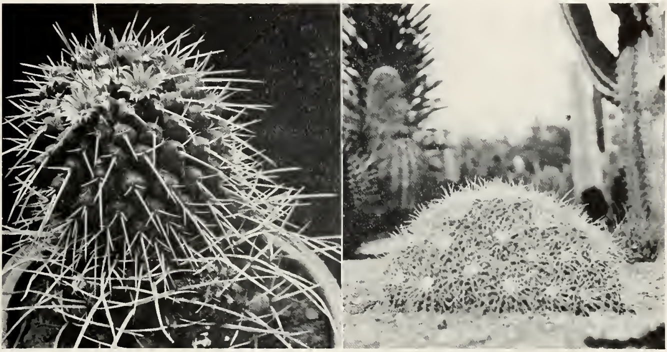
FIG. 84.—Neomammillaria compressa.

34. Neomammillaria compressa (De Candolle).

Mammillaria compressa De Candolle, Mém. Mus. Hist. Nat. Paris *17:* 112. 1828.
Mammillaria subangularis De Candolle, Mém. Mus. Hist. Nat. Paris *17:* 112. 1828.
Mammillaria triacantha De Candolle, Mém. Mus. Hist. Nat. Paris *17:* 113. 1828.
Mammillaria cirrhifera Martius, Nov. Act. Nat. Cur. *16:* 334. 1832.
Mammillaria angularis Link and Otto in Pfeiffer, Enum. Cact. 12. 1837.
Mammillaria cirrhifera angulosior Lemaire, Cact. Gen. Nov. Sp. 95. 1839.
Mammillaria longiseta Mühlenpfordt, Allg. Gartenz. *13:* 346. 1845.

Mammillaria cirrifera longiseta Salm-Dyck, Cact. Hort. Dyck. 1849. 18. 1850.
Mammillaria squarrosa Meinshausen Wochenschr. Gärten. Pflanz. *2:* 116. 1859.
Cactus cirrhifer Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus compressus Kuntze, Rev. Gen. Pl. *1:* 260. 1891. Not Salisbury, 1796.
Cactus longisetus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus squarrosus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus subangularis Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus triacanthus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
?*Mammillaria angularis fulvispina* Schumann, Gesamtb. Kakteen 576. 1898.
Mammillaria angularis longiseta Salm-Dyck in Schumann, Gesamtb. Kakteen 576. 1898
Mammillaria angularis triacantha Salm-Dyck in Schumann, Gesamtb. Kakteen 576. 1898.
Mammillaria angularis compressa Schumann, Gesamtb. Kakteen 577. 1898.
Mammillaria oettingenii Zeissold, Monatsschr. Kakteenk. *8:* 10. 1898.
Mammillaria kleinschmidtiana Zeissold, Monatsschr. Kakteenk. *8:* 21. 1898.

Growing in large clumps, cylindric, pale bluish green; axils of tubercles white-woolly, setose; tubercles short, compressed laterally, keeled below, more rounded above; young spine-areoles white-woolly; principal spines 4, sometimes with 1 to 3 very short accessory ones from the lower part of the areole; lower spine much longer, spreading or recurved, 5 to 6 cm. long, somewhat angled; all spines pale, more or less tinged with brown, with dark tips; flower small, pinkish, 10 to 12 mm. long; outer perianth-segments acute, somewhat ciliate; inner perianth-segments narrow, acuminate, with spreading tips; stamens and style pale; stigma-lobes 5, linear; fruit clavate, red; seeds brown.



FIGS. 85 and 86.—Neomammillaria compressa.

Type locality: Mexico.

Distribution: Central Mexico.

Our description is drawn largely from specimens which flowered in March 1908 and which were collected by Dr. Rose at Higuerillas, Querétaro, in 1905. Dr. Rose also found this species very abundant in the deserts of Querétaro and living specimens brought back by him have frequently flowered both in New York and Washington. These are identical with plants sent from Berlin, labeled *Mammillaria angularis longiseta.* The species as here treated is variable and more exhaustive field work might require some modifications in the description.

The varieties *Mammillaria cirrhifera major* and *M. cirrhifera fulvispina* (Salm-Dyck. Cact. Hort. Dyck. 1844. 11. 1845) are without descriptions. The two varieties *M. cirrhifera albispina* and *M. centricirrha macrothele* were listed as synonyms of *M. subangularis* by Walpers (Repert. Bot. 2: 272. 1843). To *M. subangularis* is also referred *M. subcirrhifera* by Förster (Handb. Cact. 234. 1846).

Here doubtless belongs *Mammillaria angularis fulvescens* (Salm-Dyck, Cact. Hort. Dyck. 1849. 18. 1850).

Illustrations: Schelle, Handb. Kakteenk. 264. f. 187 (?); Möllers Deutsche Gärt. Zeit. **25:** 486. f. 20; Krook, Handb. Cact. 38 (?); Gartenwelt 15: 410; Contr. U. S. Nat. Herb. **10:** pl. 16, f. B, as *Mammillaria angularis;* Möllers Deutsche Gärt. Zeit. **25:** 475. f. 8, No. 8, as *M. angularis compressa;* Pfeiffer and Otto, Abbild. Beschr. Cact. **1:** pl. 7, as *M. cirrhifera;* Möllers Deutsche Gärt. Zeit. **25:** 475. f. 8, No. 28, as *M. angularis rufispina;* Blanc, Cacti 67. f. 1170; Cact. Journ. **1:** pl. for March; **2:** 7, 93, as *M. cirrhifera longispina.*

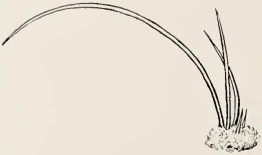


Fig. 87.—Spine-cluster of N. compressa.

Plate VIII, figure 4, shows a plant collected by Dr. Rose in Querétaro in 1905, which flowered in the New York Botanical Garden, March 17, 1913. Figure 84 is from a photograph of a plant sent by Dr. E. Palmer from San Luis Potosí in 1905; figure 85 is from a photograph of a plant collected by Dr. Rose near Higuerillas, Mexico, in 1905; figure 86 is from a photograph of this plant growing in the open in the Huntington Collection, southern California; figure 88 is from a photograph of a plant sent by Dr. C. A. Purpus from Minas de San Rafael in 1910; figure 87 shows spines from the plant collected by Dr. Rose at Ixmiquilpan in 1905.

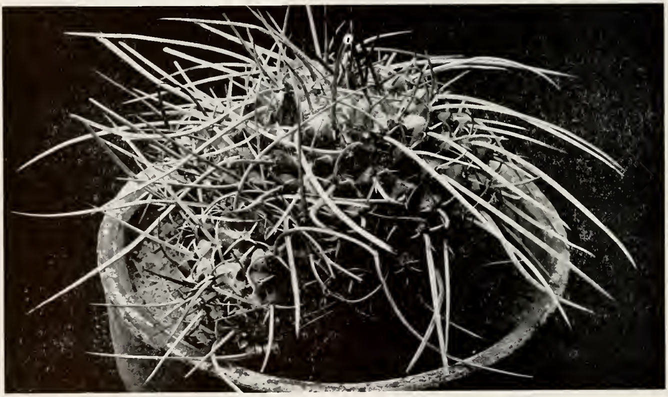


Fig. 88.—Neomammillaria compressa.

35. Neomammillaria mystax (Martius).

Mammillaria mystax Martius, Nov. Act. Nat. Cur. *16:* 332. 1832.
Mammillaria leucotricha Scheidweiler, Allg. Gartenz. *8:* 338. 1840.
Mammillaria zanthotricha Scheidweiler, Allg. Gartenz. *8:* 338. 1840.
Mammillaria mutabilis Scheidweiler, Allg. Gartenz. *9:* 43. 1841.
Mammillaria funkii Scheidweiler, Allg. Gartenz. *9:* 43. 1841.
Mammillaria autumnalis Dietrich, Allg. Gartenz. *16:* 297. 1848.
Mammillaria mutabilis xanthotricha Salm-Dyck, Cact. Hort. Dyck. 1849. 17, 120. 1850.
Mammillaria maschalacantha Monville in Labouret, Monogr. Cact. 106. 1853.
Mammillaria maschalacantha leucotricha Monville in Labouret, Monogr. Cact. 106. 1853.

Mammillaria maschalacantha xantotricha Monvillle in Labouret, Monogr. Cact. 106. 1853.
Cactus funckii Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus maschalacanthus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus leucotrichus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus mutabilis Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus mystax Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus xanthotrichus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Globose to short-cylindric, 7 to 15 cm. high, flat-topped; tubercles in as many as 34 rows, thickly set, full of milk which freely flows when pricked or cut; radial spines 8 to 10, small, white; central spines 4, 3 about twice as long as the radial ones, the other much elongated, 6 to 7 cm. long; flowers 1.5 to 2 cm. long, appearing in 2 or 3 rows, very abundant; inner perianth-segments dark red, 12 mm. long; stigma-lobes 4 or 5, greenish; fruit red, 2 to 2.5 cm. long.

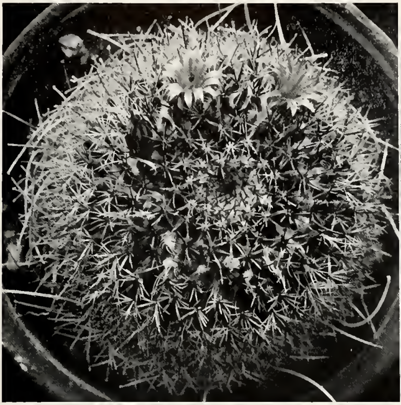


FIG. 89.—Neomammillaria mystax.

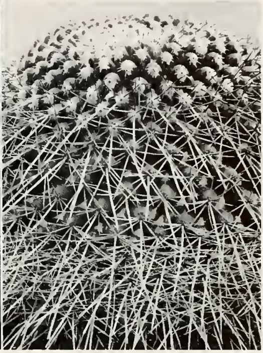


FIG. 90.—Neomammillaria petterssonii.

Type locality: Mexico. According to Hemsley, Karwinsky's plant, which is the type, came from Ixmiquilpan and San Pedro Nolasco at about 6,000 feet altitude.

Distribution: Highlands of southern central Mexico.

This species is characterized by the long, erect, central spines which overtop the plant in the wild state; in cultivation these elongated spines do not always occur. The species is common in cultivation; in collections it is usually known as *Mammillaria mutabilis.*

Mammillaria krauseana, a name from Gruson's Catalogue, is cited by Schumann (Gesamtb. Kakteen 595. 1898) as a synonym of *M. mutabilis.*

Mammillaria meschalacantha Hortus (Salm-Dyck, Cact. Hort. Dyck. 1844. 10. 1845), according to the Index Kewensis, is a misspelling for *M. maschalacantha.*

Mammillaria maschalacantha dolichacantha Monville was given as a doubtful synonym of *M. maschalacantha* by Labouret (Monogr. Cact. 106. 1853).

Mammillaria mutabilis autumnalis (Monatsschr. Kakteenk. 30: February 1920) is offered for sale by Grässner.

Mammillaria mutabilis laevior Salm-Dyck (Cact. Hort. Dyck. 1849. 17, 120. 1850), with *M. leucocarpa* Scheidweiler as a synonym, was given as a variety of *M. mutabilis,* but it was not described. *M. xanthotricha laevior* Salm-Dyck (Cact. Hort. Dyck. 1844. 11. 1845), also undescribed, seems to be the same.

Schumann refers here *Mammillaria cirrhifera*, but certainly Pfeiffer's illustration (Abbild. Beschr. Cact. **1**: pl. 7) with its long, curved, radial spines and no centrals is very different; we have referred it to *Neomammillaria magnimamma*.

Illustrations: Nov. Act. Nat. Cur. **16**: pl. 21; Möllers Deutsche Gärt. Zeit. **25**: 475. f. 8, No. 17, as *Mammillaria mystax;* Möllers Deutsche Gärt. Zeit. **25**: 475. f. 8, No. 1; Karsten and Schenck, Vegetationsbilder **1**: pl. 44; Schelle, Handb. Kakteenk. 272. f. 195, as *M. mutabilis;* Schelle, Handb. Kakteenk. 273. f. 196, as *M. mutabilis longispina*.

Plate IX, figure 5, shows a plant collected by Dr. Rose at Tehuacan which flowered and fruited in Washington in 1907. Figure 89 is from a photograph of a potted plant obtained by Dr. Rose at Tehuacan in 1905.

36. Neomammillaria petterssonii (Hildmann).

Mammillaria petterssonii Hildmann, Deutsche Garten-Zeitung *1886:* 185. 1886.
Mammillaria heeseana McDowell, Monatsschr. Kakteenk. *6:* 125. 1896.

Plants rather large for this genus, cylindric, 2 dm. high or more, very spiny; tubercles arranged in 13 or 21 spirals, terete, setose in their axils; radial spines 10 to 12, white, with black tips; central spines 4, the longer ones 4.5 cm. long; flowers unknown; fruit small, naked, oblong.

Type locality: Mexico.

Distribution: Guanajuato, Mexico.

We have followed Schumann in uniting *Mammillaria petterssonii* and *M. heeseana* but have selected the older name.

Dr. Rose collected this plant in Guanajuato in 1889 (No. 4846) and Dr. Safford obtained it there a few years later.

Mammillaria heeseana brevispina and *M. heeseana longispina* are two varieties listed by Schelle.

Illustrations: Ann. Rep. Smiths. Inst. **1908**: pl. 7; Schelle, Handb. Kakteenk. 265. f. 188, as *Mammillaria heeseana;* Blanc, Cacti 70. f. 1350, as *M. krameri* (this is the same figure as that used by Schelle as *M. heeseana*); Cact. Journ. **1**: pl. for March; Blanc, Cacti 73. No. 1460; Deutsche Garten-Zeitung **1886**: 186. f. 45, as *M. petterssonii*.*

Figure 90 is a reproduction of the first illustration cited above.

37. Neomammillaria eichlamii (Quehl).

Mammillaria eichlamii Quehl, Monatsschr. Kakteenk. *18:* 65. 1898.

Solitary or growing in large clumps of 25 or more, but loosely held together; plant-body cylindric, 6 to 15 cm. long; tubercles yellowish green, very milky, only slightly angled; axils filled with dense yellow (sometimes whitish) wool and longer white bristles; radial spines 7 or 8, ascending, whitish with brown tips; central spines usually 1, rarely 2, stouter, darker colored than the radials; spine-areoles when young filled with short yellow wool, in age glabrate; flower-buds covered with long wool; outer perianth-segments narrow, acuminate, with a dark red stripe down the center, otherwise cream-colored, slightly ciliate; inner perianth-segments narrowly lanceolate, acuminate, entire, cream-colored to light lemon-yellow; style longer than the stamens, pale; stigma-lobes linear, 4 to 6, yellow, obtuse.

Type locality: Guatemala.

Distribution: Guatemala and Honduras.

This plant differs from the other Guatemalan species in the yellow wool in the axils of the tubercles and in the areoles.

Our first knowledge of this species came from a photograph and living and herbarium material collected by Dr. William R. Maxon in Guatemala in 1905. In 1908 Quehl described it as new from specimens sent by F. Eichlam; the plant since then has been common in cultivation. It flowered first in Washington, December 1909.

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* This name appears as *M. petersonii* in Blanc and Schumann.

The plant is named for Federico Eichlam (1862-1911), an enthusiastic cactus collector who made very valuable discoveries in Guatemala. He published a cactus list in 1911 (Kakteen-Verzeichnis Abgeschlosen Ende 1910).

Illustrations: Monatsschr. Kakteenk. **19:** 7; Möllers Deutsche Gärt. Zeit. **25:** 475. f. 8, No. 14, as *Mammillaria eichlamii.*

Figure 91 is from a photograph of a plant collected in Guatemala by F. Eichlam in 1908.

38. Neomammillaria karwinskiana (Martius).

Mammillaria karwinskiana Martius, Nov. Act. Nat. Cur. *16:* 335. 1832.
(?) *Mammillaria fischeri* Pfeiffer, Allg. Gartenz. *4:* 257. 1836.
Mammillaria centrispina Pfeiffer, Allg. Gartenz. *4:* 258. 1836.
Mammillaria karwinskiana flavescens Zuccarini in Pfeiffer, Enum. Cact. 19. 1837.
(?) *Mammillaria virens* Scheidweiler, Allg. Gartenz. *9:* 43. 1841.
Mammillaria karwinskiana virens Salm-Dyck, Cact. Hort. Dyck. 1844. 10. 1845.
Mammillaria karwinskiana centrispina Salm-Dyck, Cact. Hort. Dyck. 1844. 10. 1845.
Cactus centrispinus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus fischeri Kuntze, Rev. Gen. Pl. 1: 260. 1891.
Cactus karwinskianus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus virens Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

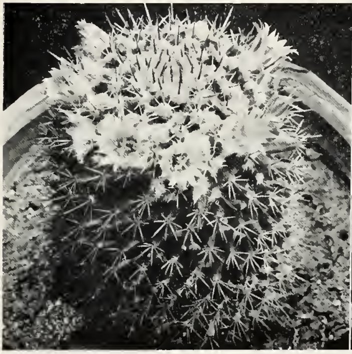


FIG. 91.—Neomammillaria eichlamii.

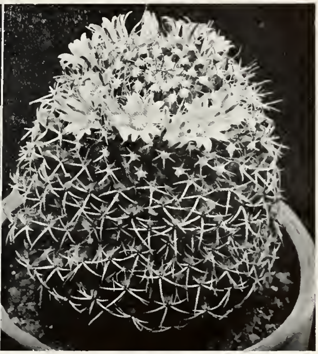


FIG. 92.—Neomammillaria karwinskiana.

Globose to cylindric, somewhat flattened above; tubercles terete, yielding milk when pricked; axils very woolly and with long conspicuous white or brown-tipped bristles, much longer than the tubercles; spines 4, 5, or 6, all radial, sometimes one nearer the center than the others, nearly equal, short, brown or blackish at the tips or throughout; flowers nearly 2 cm. long, the scales and outer perianth-segments narrow, reddish except at the margins, ciliate; inner perianth-segments broader, cream-colored, not ciliate, mucronate-tipped; stamens cream-colored, much shorter than the inner perianth-segments; style a little longer than the stamens; stigma-lobes 5, cream-colored; fruit 15 mm. long, red; seeds brown.

Type locality: Mexico.

Distribution: Oaxaca, Mexico.

This species is near *Neomammillaria mystax* but the spines are usually radial, short, and nearly equal. Specimens sent to Washington in 1918 had some of the lowermost spines much elongated and curved backward, sometimes 2.5 cm. long.

The plant flowers readily in cultivation. Professor C. Conzatti has repeatedly sent it to us from Oaxaca.

Illustrations: Nov. Act. Nat. Cur. **16:** pl. 22; Ann. Rep. Smiths. Inst. **1908:** pl. 14, f. 4, as *Mammillaria karwinskiana.*

Plate XI, figure 2, shows a plant collected by Dr. Rose in Oaxaca in 1906, which flowered in Washington, April 16, 1907; plate IX, figure 2, shows a plant collected by B. P. Reko also in Oaxaca, which fruited in the New York Botanical Garden in 1918. Figure 92 is from a photograph of a plant collected by Dr. Rose in Oaxaca in 1906.

Related to this species is the following:

MAMMILLARIA KNIPPELIANA Quehl, Monatsschr. Kakteenk. **17:** 59. 1907.

Stem solitary, about 7 cm. high by 6 cm. in diameter, slightly depressed at apex; tubercles when young pyramidal, 4-sided, 8 mm. long, their axils setose; areoles circular, at first white-woolly, soon glabrate; spines usually 6, up to 6 cm. long, whitish with blood-red or brown tips, sometimes accompanied with smaller spines; flowers and native country unknown.

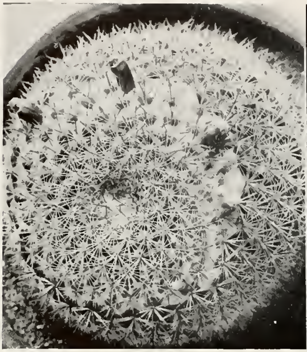


FIG. 93.—Neomammillaria standleyi.

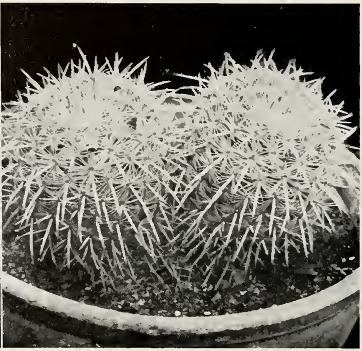


FIG. 94.—Neomammillaria parkinsonii.

39. Neomammillaria praelii (Mühlenpfordt).

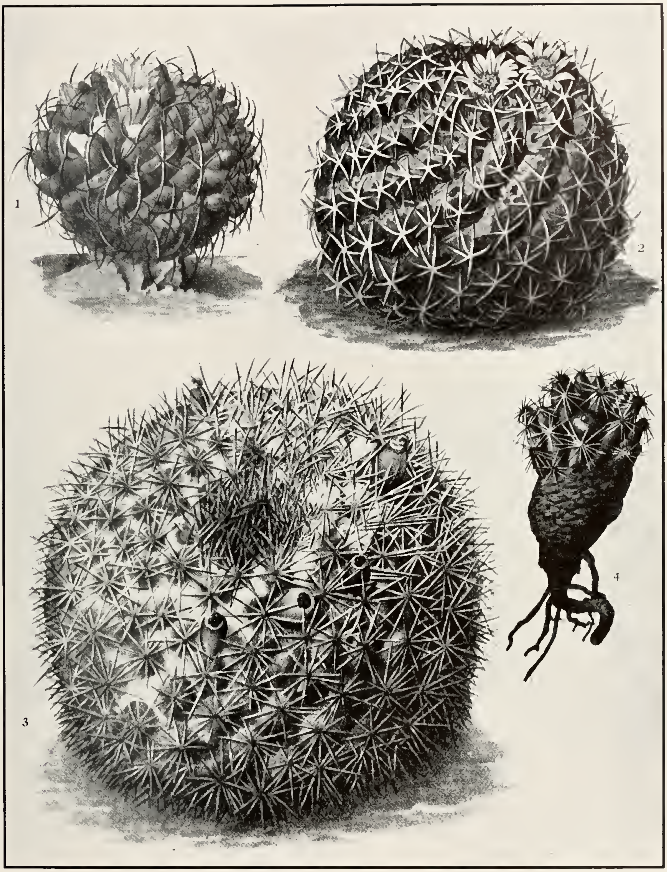
Mammillaria praelii Mühlenpfordt, Allg. Gartenz. *14:* 372. 1846.
Mammillaria viridis praelii Salm-Dyck, Cact. Hort. Dyck. 1849. 16. 1850.
Mammillaria viridis Salm-Dyck, Cact. Hort. Dyck. 1849. 116. 1850.
Mammillaria inclinis Lemaire, Illustr. Hort. *5:* Misc. 9. 1858.
Cactus praelii Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus viridis Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Globose, light green, sunken at the apex; axils of the tubercles lanate and setose; tubercles somewhat 4-angled; spine-areoles villous; spines 4, radial, forming a cross, the uppermost and lowermost elongated; flowers and fruit unknown.

Type locality: Guatemala.

Distribution: Guatemala.

We do not know this species but we are following previous authors in our classification of it. When flowers and fruit become known this may be subject to modification. Until recently it and *Neomammillaria woburnensis* were the only species of this genus known from Guatemala; neither was known in cultivation. Through the efforts of Dr. William R. Maxon, Mr. F. Eichlam, Professor Kellermann, and others, much material has been collected, new species discovered, and *N. woburnensis* rediscovered, but not *N. praelii.*



1. Flowering plant of *Neomammillaria magnimamma.*
2. Flowering plant of *Neomammillaria karwinskiana.*
3. Fruiting plant of *Neomammillaria gigantea.*
4. Fruiting plant of *Neobesseya missouriensis.*

(All three-fourths size.)

Schumann described the plant in some detail, but apparently confused it with another species, possibly *Mammillaria karwinskiana,* inasmuch as he reported it from Oaxaca as well as from Guatemala. He referred here as a synonym *M. viridis* Salm-Dyck (Cact. Hort. Dyck. 1849. 16. 1850), which may be the Mexican element.

40. **Neomammillaria standleyi** sp. nov.

Plants usually solitary, nearly globular, often 10 cm. in diameter, pale green, densely covered with spines; axils of tubercles containing white bristles, the flowering and fruiting ones filled with dense white wool; radial spines about 16, slightly spreading, white except the dark tips; central spines 4, longer and stouter than the radials, porrect, reddish brown; flowers rather small, about 12 mm. long, purplish; inner perianth-segments oblong, entire; filaments pale; stigma-lobes green; fruit scarlet, 12 to 16 mm. long; seeds brownish.

Collected by Rose, Standley, and Russell on rocks in the Sierra de Alamos, Sonora, Mexico, March 14, 1910 (No. 12849).

It is common in dry stony places above Alamos, where both living and herbarium specimens were obtained, and is an attractive plant flowering freely in cultivation.

The plant is named for Paul C. Standley of the U. S. National Museum.

Figure 93 is from a photograph of the type specimen which flowered in Washington.

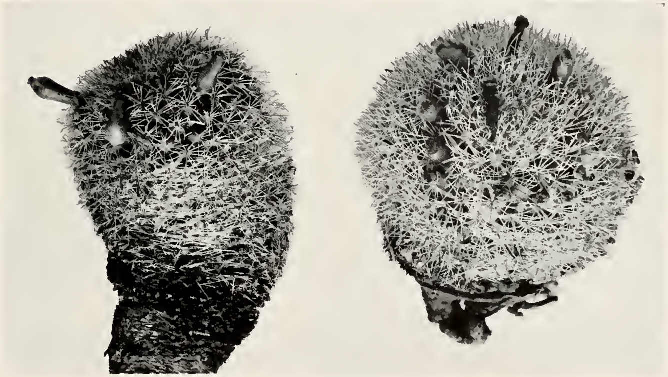


FIG. 95.—Neomammillaria evermanniana.

41. **Neomammillaria evermanniana** sp. nov.

Globose to elongate-turbinate, 5 to 7 cm. in diameter, lactiferous; tubercles closely set, terete, nearly hidden under the numerous slender spines; axils of tubercles at first very woolly and setose; spines white except at tip and there brown; radial spines 12 to 15; central spines 3, erect or nearly so; fruit red, about 1 cm. long; seeds brown.

Collected by Ivan M. Johnston on Cerralbo Island, Gulf of California, 1921 (No. 4058).

Mr. Johnston writes of it as follows:

"I found it growing wedged in narrow dirt-filled cracks on the canyon side of the island. It is quite common on this island, usually growing singly, but one cespitose mass with 19 unequal heads was observed."

The species is named for Dr. Barton W. Evermann, Director of the Museum of the California Academy of Sciences, who organized the scientific expedition to the Gulf of California in 1921, which obtained this as well as many other new and rare plants.

Related to this species, but perhaps distinct from it, is Johnston's No. 3121 from Nolasco Island, Gulf of California. It has fewer spines (about 10 radials and 1 or 2 centrals).

Figure 95 is from a photograph of plants from the type collection.

42. Neomammillaria parkinsonii (Ehrenberg).

Mammillaria parkinsonii Ehrenberg, Linnaea *14:* 375. 1840.
Cactus parkinsonii Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Cespitose, somewhat depressed to cylindric, 15 cm. high, 7.5 cm. in diameter, globose, glaucous, green; axils of tubercles lanate and setose; tubercles milky, short, conic; radial spines numerous 20 or more), setaceous, short, white; central spines 2 or sometimes 4 or 5, brownish at tip; flowers surrounded by a mass of wool, small, yellowish; inner perianth-segments apiculate; stigma-lobes elongated; fruit clavate, scarlet, 1 cm. long; seeds brown.

Type locality: At San Onofre in the Mineral del Doctor, Mexico.

Distribution: Central Mexico.

We have a photograph, identified as this plant, sent us by L. Quehl in 1921, and also specimens which are like this photograph, collected by Dr. Rose near Higuerillas, Querétaro, Mexico, in 1905 (No. 9798).

The plant was named for John Parkinson, at one time British Consul-General in Mexico, who died in Paris, April 3, 1847.

Mammillaria parkinsonii rubra (Förster, Handb. Cact. 196. 1846) is only a name.

Mammillaria parkinsonii waltonii we do not know, although it is frequently referred to in cactus literature. Haage and Schmidt offer it for sale in their catalogue (1920) under the name of *M. waltonii* Quehl.

Illustrations: Cact. Journ. **1:** pl. for March, as *Mammillaria waltonii;* Gartenwelt **14:** 232; Möllers Deutsche Gärt. Zeit. **25:** 475. f. 8, No. 15; Rother, Praktischer Leitfaden Kakteen 39, as *M. parkinsonii.*

Figure 94 is from a photograph sent by L. Quehl.

43. Neomammillaria geminispina (Haworth).

Mammillaria geminispina Haworth in Gillies, Phil. Mag. *63:* 42. 1824.
Mammillaria bicolor Lehmann, Samen. Handb. Gartz. 7. 1830.
Mammillaria nivea Wendland in Pfeiffer, Enum. Cact. 27. 1837.
Mammillaria daedalea Scheidweiler, Hort. Belge *4:* 16. 1837.
Mammillaria toaldoae Lehmann, Linnaea *12:* 13. 1838.
Mammillaria eburnea Miquel, Linnaea *12:* 14. 1838.
Mammillaria nivea daedalea Lemaire, Cact. Gen. Nov. Sp. 101. 1839.
Mammillaria nobilis Pfeiffer, Allg. Gartenz. *8:* 282. 1840.
Mammillaria bicolor longispina Salm-Dyck, Cact. Hort. Dyck. 1844. 6. 1845.
Mammillaria bicolor cristata Salm-Dyck, Cact. Hort. Dyck. 1844. 6. 1845.
Mammillaria bicolor nobilis Förster, Handb. Cact. 198. 1846.
Cactus geminispinus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus niveus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus nobilis Kuntze, Rev. Gen. Pl. *1:* 261. 1891. Not Lamarck, 1783.
Mammillaria bicolor nivea Schumann, Gesamtb. Kakteen 569. 1898.

Cespitose, or single in cultivation, cylindric, somewhat glaucous; axils woolly; tubercles terete, conic; radial spines numerous (16 to 20), very short, setaceous, white; central spines 2 to 4, stouter and longer than the radials, about 25 mm. long, black-tipped; flowers dark red; inner perianth-segments oblong, obtuse, serrate.

Type locality: Mexico.

Distribution: North-central Mexico.

Mammillaria daedalea, which is referred here by Schumann, is based on an abnormal specimen which has elongated, contorted stems and looks very unlike the typical plant. Scheidweiler illustrated his species.

Mammillaria nivea cristata Salm-Dyck (Walpers, Repert. Bot. **2**: 270. 1843) is only a name. *M. nivea wendlei* Pfeiffer (Labouret, Monogr. Cact. 57. 1853) was given as a synonym of *M. bicolor.*

To this relationship we would refer the plant which has long been known in collections under the name of *Mammillaria potosina*[*] and *M. potosina* var. *longispina.* It resembles *M. celsiana* in the spines, but the tubercles are milky and the stem is more elongated. We have seen the following illustration: Möllers Deutsche Gärt. Zeit. **25**: 475. f. 8, No. 9, as *M. potosina.*

De Candolle (Prodr. **3**: 459. 1828) referred here *Cactus columnaris* Mociño and Sessé.

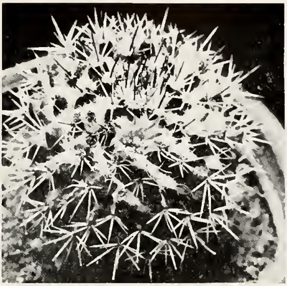


FIG. 96.—Neomammillaria collinsii.

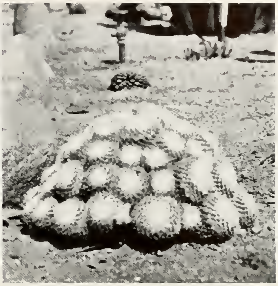


FIG. 97.—Neomammillaria geminispina.

Illustrations: Wiener Ill. Gart. Zeit. **11**: pl. 3, in part, as *Mammillaria nobilis;* Hort. Belge **4**: pl. 1, as *M. daedalea;* Möllers Deutsche Gärt. Zeit. **25**: 475. f. 8, No. 4, as *M. bicolor nobilis;* Cact. Journ. **1**: pl. for March, as *M. nivea cristata;* Cact. Journ. **1**: pl. for March, as *M. nivea longispina;* Pfeiffer and Otto, Abbild. Beschr. Cact. **1**: pl. 3; De Laet, Cat. Gén. f. 50, No. 8; Wiener Ill. Gart. Zeit. **29**: f. 22, No. 8; Knippel, Kakteen pl. 19, as *M. bicolor.*

Plate V, figure 3, shows a flowering plant sent by Carl Ackerman which flowered in the New York Botanical Garden, October 9, 1920; plate VIII, figure 5, shows a plant which flowered in the New York Botanical Garden, November 11, 1911. Figure 97 is from a photograph by Ernest Braunton showing a plant grown in southern California.

44. Neomammillaria pyrrhocephala (Scheidweiler).

Mammillaria pyrrhocephala Scheidweiler, Allg. Gartenz. *9:* 42. 1841.
Mammillaria mallettiana Cels, Portef. Hort. *2:* 222.
Mammillaria senckei[†] Förster, Handb. Cact. 227. 1846.
Mammillaria pyrrhocephala donkelaeri Salm-Dyck, Cact. Hort. Dyck. 1849. 17, 121. 1850.
Cactus pyrrhocephalus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Cylindric; axils lanate and setose; tubercles angled, green or subglaucous; areoles bearing yellowish wool; spines all black when young, when old becoming gray below; radial spines 6, spreading, the upper ones a little longer; central spines single, erect; flowers red.

Type locality: Real del Monte, Mexico.

Distribution: Hidalgo and, perhaps, Oaxaca.

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[*] This name is sometimes credited to Rebut (Möllers Deutsche Gärt. Zeit. *25:* 475. 1910) but if he published it we are unaware of it.

[†] This was originally written *M. senkii,* although the plant was named for F. Senke of Leipzig.

We have followed Schumann and others who refer this species also to Oaxaca but the plants from that state may represent more than one species. In fact, the plant figured in Blühende Kakteen we have described as new (see No. 50), while the one illustrated by Mr. H. H. Thompson is like others sent by Dr. Reko and Professor Conzatti, which we have referred here.

Illustration: Thompson, U. S. Dept. Agr. Bur. Pl. Ind. Bull. **262:** pl. 2, f. 2, as *Mammillaria pyrrhocephala.*

Figure 100 is from a photograph of the plant sent to Washington by Dr. Reko from Oaxaca in 1919.

45. Neomammillaria woburnensis (Scheer).

Mammillaria woburnensis * Scheer, Lond. Journ. Bot. *4:* 136. 1845.
Cactus woburnensis Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Mammillaria chapinensis Eichlam and Quehl, Monatsschr. Kakteenk. *19:* 1. 1909.

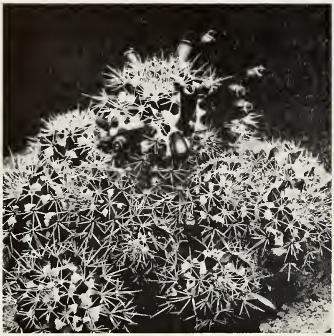

FIG. 98.—Neomammillaria woburnensis.

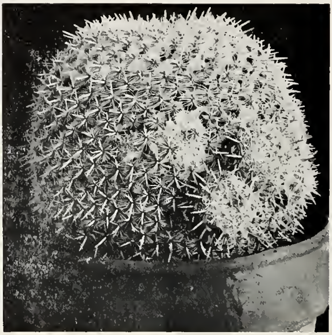

FIG. 99.—Neomammillaria chinocephala.

Growing in clumps, giving off new plants from all parts of the body, globose to cylindric, dull green, milky; tubercles angled, setose and woolly in their axils; radial spines 5 to 9, yellowish or white; central spines 1 to 8, often long, reddish or yellow; flowers yellow, small, about 1 cm. long; fruit red, clavate, 18 to 25 mm. long; seeds minute, brown.

Type locality: Guatemala.

Distribution: Guatemala.

For a long time little was known about this plant, but a few years ago it was discovered in abundance by Wm. R. Maxon (1905) and by F. Eichlam (1908). It was given a new name, *Mammillaria chapinensis,* under which it is to be found in most collections.

The plant was described by Frederick Scheer from a barren specimen in the Royal Botanical Garden at Kew, sent from Guatemala. It was named for Woburn Abbey, where there was once a very large collection of cacti under the care of James Forbes.

Illustrations: Monatsschr. Kakteenk. **24:** 87; Succulenta **4:** 40; Möllers Deutsche Gärt. Zeit. **25:** 475. f. 8, No. 12, as *Mammillaria chapinensis.*

Figure 98 is from a photograph of a plant sent to Washington by F. Eichlam in 1908.

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* This name was originally printed by Scheer as *Mamillaria voburnensis.*

46. **Neomammillaria collinsii** sp. nov.

Plants becoming large clumps, the individuals globose, 4 cm. in diameter; tubercles terete, milky, green, but becoming bronzed or even a deep purple; axils of tubercles both lanate and setose; radial spines usually 7, pale yellowish below, with dark brown or blackish tips, subequal, 5 to 7 mm. long; central spine 1, similar to or a little longer and usually darker than the radials; flowers 12 to 15 mm. long; outer perianth-segments reddish with a yellowish margin, ciliate; inner perianth-segments lighter, entire, acuminate; fruit clavate, 1.5 to 2 cm. long, deep red; seeds brownish.

Collected by G. N. Collins at San Gerónimo, near Tehuantepec, Mexico, December 1906, and flowered in Washington, July and August 1909, type, and near the same locality by A. Groeschner, February 1923.

Figures 96 and 103 are from photographs showing the type plant in flower and fruit.

47. **Neomammillaria chinocephala** (J. A. Purpus).

Mammillaria chinocephala J. A. Purpus, Monatsschr. Kakteenk. *16:* 41. 1906.

Plant-body globose, sometimes 8 cm. in diameter, almost hidden by the white spines; tubercles very milky; axils of tubercles densely filled with white wool and numerous hair-like bristles; tubercles low; radial spines 35 to 40, somewhat pectinate, spreading; central spines 2 to 7, more or less divergent, much stouter than the radials, rigid, white with brownish tips; flowers 1 cm. long, rose-red; fruit clavate, red; seeds small, brown.

Type locality: Sierra de Parras, Coahuila, Mexico.

Distribution: Highlands of central Mexico.

This species is common in collections, both living and dried, and it is surprising that it remained so long undescribed. It was distributed by Pringle in 1890 as *Mammillaria acanthophelgma.* It resembles very much a large plant of *Mammillaria elegans,* but the tubercles are milky and bear setae in their axils.

Illustrations: Monatsschr. Kakteenk. **16:** 43; **20:** 46, as *Mammillaria chinocephala.*

Figure 99 is from a photograph of a plant collected by Dr. Purpus at Minas de San Rafael, Mexico, in 1910.

48. **Neomammillaria tenampensis** sp. nov.

Globose, light green, 5 to 6 cm. in diameter; tubercles 6 to 7 mm. long, 4-sided, milky, pointed; axils of upper tubercles naked, but those producing flowers filled with yellow wool and numerous yellow bristles, while in the older axils the wool disappears and the bristles become white; spines 4 to 6, brownish with dark tips, ascending, surrounded at base by 8 to 10 small white bristles; wool in young spine-areoles yellowish; outermost perianth-segments small, brownish, the outer ones lanceolate, acuminate, similar to the inner ones, all ciliate; inner perianth-segments reddish purple, 8 to 10 mm. long, lanceolate, apiculate, denticulate; stamens much shorter than the perianth-segments; filaments pale below, purplish above; style reddish; stigma-lobes 4 or 5.

Collected by C. A. Purpus in the Barranca de Tenampa, Mexico, in 1909 and flowered in Washington in November 1910.

Figure 102 is from a photograph of the type specimen.

49. **Neomammillaria polygona** (Salm-Dyck).

Mammillaria polygona Salm-Dyck, Cact. Hort. Dyck, 1849. 120. 1850.
Cactus polygonus Kuntze, Rev. Gen. Pl. *1:* 261. 1891. Not Lamarck, 1783.

Subclavate, 10 cm. high, simple; axils of tubercles lanate and setose; tubercles 4-angled; radial spines about 8, 2 or 3 upper ones minute, the 4 lateral ones and the lowermost one longer; central spines 2, stout, brownish at tip, often long and recurved; flowers pale rose-colored; stigma-lobes 5 or 6, linear.

Type locality: Not cited.

Distribution: Mexico, according to Labouret.

Schumann lists this species among those unknown to him. Rümpler refers it to *Mammillaria subpolyedra,* but it must be related more nearly to *M. polyedra,* with which it was compared by Salm-Dyck. We know it only from descriptions.

Mammillaria polyedra spinosior Salm-Dyck (Cact. Hort. Dyck. 1849. 17. 1850) is usually referred here, but was never described.

Related to this species is the following:

MAMMILLARIA ECHINOPS Scheidweiler, Hort. Belge **5**: 95. 1838.

Simple, globose or a little broader than high, 8 cm. in diameter, lactiferous; tubercles ovoid, light green, somewhat 4-angled, lanate and setose in their axils; radial spines 12 or 13, the upper three much shorter, setose, the others about equal; central spines 4, stout when young, white, with rosy brown tips, these black in age; flowers not known; fruit red, clavate, 8 mm. long.

Type locality: Mexico.

We have not been able to associate this description or illustration with any species which we known. The author believed that it was related to *Mammillaria polyedra.* The setae in the axils of the tubercles suggest this relationship, but we believe that it is very distinct from that species.

The original description seems to have been unknown to the compilers of the Index Kewensis and to Schumann, for they refer the name to Förster's Handbuch, where it is used as a synonym of another species. Förster, followed by the Index Kewensis, refers it as a synonym of *Mammillaria oothele,* which is a very different plant if we can judge from the description.

Illustration: Hort. Belge **5**: pl. 5.

50. Neomammillaria confusa sp. nov.

At first solitary, becoming cespitose, globose to short-cylindric, deep green; axils densely white-woolly and setose; tubercles short, a little flattened, 4-angled, pointed; spines 4 to 6, all radial, ascending, at first yellowish with brown tips, in age white below, 2 to 3 mm. long; flowers yellow, small, about 8 mm. long, opening for 2 or 3 successive days; outer perianth-segments ovate, ciliate, with a black tip; inner perianth-segments spreading, acute; filaments and style yellowish white; stigma-lobes 6, greenish yellow.

In 1912 Dr. Rose obtained a plant from W. Mundt near Berlin which flowered in the New York Botanical Garden in April 1914 and in 1918 and which we have designated as the type. It is not known in the wild state, but is doubtless from Mexico.

This is the plant which Schumann described and figured as *Mammillaria pyrrhocephala,* but it does not accord with the original description.

Illustration: Blühende Kakteen **1**: pl. 20, as *Mammillaria pyrrhocephala.*

Plate v, figure 2, shows the type plant.

51. Neomammillaria villifera (Otto).

Mammillaria villifera Otto in Pfeiffer, Enum. Cact. 18. 1837.
Cactus villifer Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Mammillaria carnea villifera Gürke, Blühende Kakteen *1:* under pl. 60. 1905.

Subglobose, proliferous; axils lanate and setose; tubercles angled; areoles at first lanate, in age naked; spines 4, rigid, straight, the lowest one longer (8 mm. long), at first purplish, in age black; flowers pale rose-colored; inner perianth-segments 14, acute; stigma-lobes 4 or 5.

Type locality: Mexico.

Distribution: Mexico, but range not known.

The species is often referred to *Mammillaria carnea,* but the axils are setose.

52. Neomammillaria polyedra (Martius).

Mammillaria polyedra Martius, Nov. Act. Nat. Cur. *16:* 326. 1832.
Mammillaria polytricha Salm-Dyck, Allg. Gartenz. *10:* 289. 1842.
Mammillaria polytricha hexacantha Salm-Dyck, Allg. Gartenz. *10:* 289. 1842.
Mammillaria polytricha tetracantha Salm-Dyck, Allg. Gartenz. *10:* 290. 1842.
Mammillaria polyedra laevior Salm-Dyck in Labouret, Monogr. Cact. 105. 1853.
Mammillaria polyedra scleracantha Labouret, Monogr. Cact. 105. 1853.
Cactus polyedrus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus polytrichus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Solitary, cylindric or somewhat thicker above; axils of tubercles setose; tubercles 12 mm. long, flattened dorsally, angled, pointed; spines 4, ascending, short, grayish with purplish tips; flowers inconspicuous, reddish; inner perianth-segments short-acuminate; anthers white; style white, longer than the stamens; stigma-lobes 8, greenish; fruit unknown.

Type locality: Near Oaxaca, Mexico.

Distribution: Southern Mexico.

This species was collected by Baron Karwinsky near Oaxaca City, about 1832. It has been reported over a large area of central Mexico, but is doubtless much more restricted in range. One small specimen from near the type locality was sent to Washington in 1909.

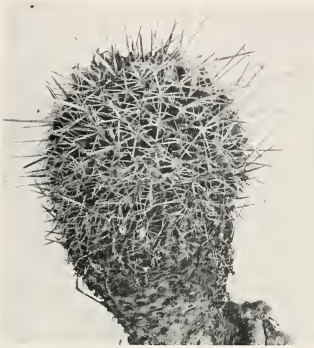

FIG. 100.—Neomammillaria pyrrhocephala.

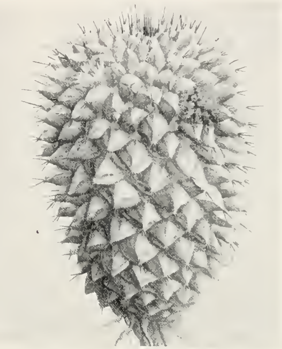

FIG. 101.—Neomammillaria polyedra.

Mammillaria anisacantha Hortus first appeared as a synonym of *M. polyedra anisacantha* Salm-Dyck (Cact. Hort. Dyck. 1844. 11. 1845) and then as a synonym of *M. polyedra laevior* Salm-Dyck (Cact. Hort. Dyck. 1849. 17. 1850); neither of the varieties was here described, but the latter was briefly characterized by Labouret. *Mammillaria scleracantha* is cited from Monville's Catalogue of 1846 but we have not seen this publication; it does occur as a synonym of *M. polyedra scleracantha* in Labouret's Monograph, p. 105.

Illustrations: Martius, Nov. Act. Nat. Cur. **16**: pl. 18; Blühende Kakteen **2**: pl. 112; Schelle, Handb. Kakteenk. 271. f. 194, as *Mammillaria polyedra.*

Plate XII, figure 5, shows the plant sent from the Berlin Botanical Garden in 1914 which flowered in the New York Botanical Garden on April 1, 1918. Figure 101 shows the type plant, being a reproduction of the first illustration cited above.

53. **Neomammillaria conzattii** sp. nov.

Short-cylindric, 8 cm. high, sometimes branched at apex, dark green, very milky; axils of young tubercles bearing abundant white wool and conspicuous white bristles; tubercles short, 4 to 5 mm. long, somewhat angled; young spine-areoles woolly; spines 4 or 5, all radial, somewhat spreading, brownish, the tips usually darker than the bases; flowers opening in bright sunlight, white, campanulate, sometimes tinged with red, about 2 cm. long, the segments somewhat spreading, narrowly oblong, the outer ones serrulate, apiculate; style pale green; stigma-lobes 3, white.

Collected by C. Conzatti on Cerro San Felipe. Oaxaca, in 1907 and flowered in 1913 (type); collected again in 1921 (No. 4140) and flowered in April 1922.

Figure 104 is from a photograph of the plant collected by C. Conzatti in 1921.

54. Neomammillaria napina (Purpus).

Mammillaria napina Purpus, Monatsschr. Kakteenk. *22:* 161. 1912.

Roots thick, but when in a cluster of 3 or 4 somewhat spindle-shaped; plants globose, 4 to 6 cm. in diameter; tubercles low, terete in section, not at all milky; spines all radial, 10 to 12, pectinate, white or yellowish, spreading and interlacing; flowers unknown.

Type locality: Mountains west of Tehuacán, Mexico.

Distribution: Southern Mexico.

The plant was collected by C. A. Purpus in 1911. In 1901 Dr. Rose collected near Tehuacán three small plant which we now believe are to be referred here; these differ from the type plant chiefly in having usually one porrect central spine 5 to 8 mm. long. Some of the spine-clusters have no central spines and then they look very much like those of *Neomammillaria napina.* Dr. Rose's plants were globose when collected but now are cylindric, and after 20 years are less than 6 cm. high; they have never flowered.

Illustration: Monatsschr. Kakteenk. **23:** 123, as *Mammillaria napina.*

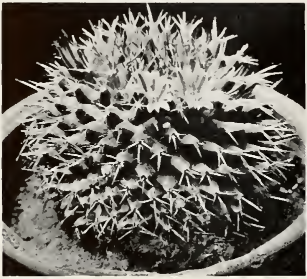

Fig. 102.—Neomammillaria tenampensis.

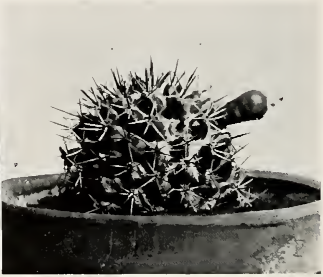

Fig. 103.—Neomammillaria collinsii.

55. Neomammillaria lanata sp. nov.

Small, short-cylindric; tubercles short, 2 to 4 mm. long; spine-areoles short-elliptic; spines 12 to 14, all radial, widely spreading, white except the brown bases; flowering areoles very woolly, the young flowers surrounded by a mass of long white hairs; flowers very small, 6 to 7 mm. long, red; inner perianth-segments about 15, oblong, obtuse or acutish, spreading above; stigma-lobes 3, short, obtuse.

Collected by C. A. Purpus near Río de Santa Luisa, Mexico, in 1907 and since grown in Washington.

Figure 105 is from a photograph of the type specimen.

56. Neommmillaria kewensis (Salm-Dyck).

Mammillaria kewensis Salm-Dyck, Cact. Hort. Dyck. 1849. 112. 1850.

Globose to cylindric, 3 to 4 cm. in diameter; tubercles short, terete, when young short-woolly in the axils and at the areoles; spines 5 or 6, all radial, 4 or 5 mm. long, brown with dark tips; axils of tubercles bearing crisp hairs; flowers about 15 mm. long, reddish purple; perianth-segments lanceolate, acute; stigma-lobes 5, reddish.

Type locality: Not cited.

Distribution: Doubtless Mexico.

We have had a living plant from Haage and Schmidt and one from Quehl which we have used in our description.

Salm-Dyck (Cact. Hort. Dyck. 1849. 15. 1850) mentions *Mammillaria kewensis* var. *albispina* and also *M. spectabilis* Hortus as synonyms.

This plant was named for the Royal Botanic Gardens, Kew.

Illustration: Möllers Deutsche Gärt. Zeit. **25:** 475. f. 8, No. 3, as *Mammillaria kewensis.*

Figure 106 is reproduced from a photograph sent us by L. Quehl in 1921.

57. Neomammillaria subpolyedra (Salm-Dyck).

Mammillaria subpolyedra Salm-Dyck, Hort. Dyck. 343. 1834.
Cactus subpolyedrus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Solitary, subcylindric, 10 cm. high, 6 cm. in diameter; tubercles pointed, strongly angled; axils and spine-areoles white-woolly; spines 4, at first blackish purple, becoming paler but the tips remaining purplish, the lowest one the largest; flowers 2.5 cm. broad; perianth-segments obtuse, erose, with a darker midrib; fruit red, 2.5 cm. long, pyriform, 12 mm. in diameter at apex.

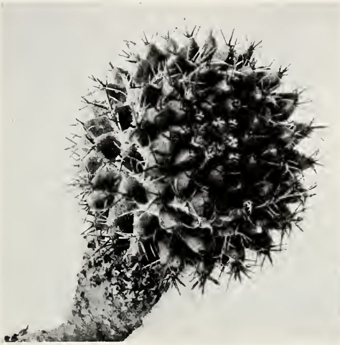

Fig. 104.—Neomammillaria conzattii.

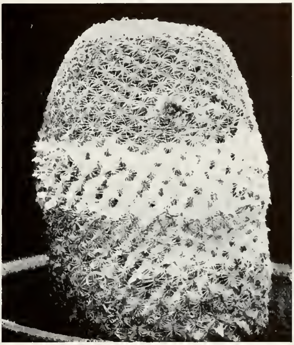

Fig. 105.—Neomammillaria lanata.

Type locality: Not cited.

Distribution: According to Rümpler, Zimapán and Ixmiquilpan, Mexico.

Some of the illustrations here cited do not correspond very well with the original description. This species is listed by Schumann with those unknown to him, and it is known to us only from descriptions and illustrations.

Mammillaria polygona Zuccarini (Pfeiffer, Enum. Cact. 17. 1837) is referred here but it was never described. Salm-Dyck afterwards used the name for a very different plant.

Mammillaria jalappensis and *M. anisacantha* are referred by Pfeiffer (Enum. Cact. 17. 1837) as synonyms of *M. subpolyedra.*

Illustrations: (?) Förster, Handb. Cact. ed. 2. 357. f. 37; (?) Dict. Gard. Nicholson 4: 565. f. 39; Suppl. 518. f. 557; Watson, Cact. Cult. 176. f. 71; ed. 3. f. 48, as *Mammillaria subpolyedra.*

Figure 107 is reproduced from the illustration used in Nicholson's Dictionary.

58. Neomammillaria galeottii (Scheidweiler).

Mammillaria galeottii Scheidweiler, Hort. Belge *4:* 93. 1837.
Mammillaria obconella galeottii Scheidweiler, Hort. Belge *4:* 93. 1837.
Mammillaria dolichocentra galeottii Salm-Dyck in Förster, Handb. Cact. 213. 1846.
Mammillaria dolichocentra phaeacantha Labouret, Monogr. Cact. 50. 1853.

Solitary or cespitose, globose; tubercles pointed; spines 4, elongated, the upper ones erect and connivent over apex of plant, on older tubercles weak and spreading, 2.5 cm. long, pale rose to crimson.

Type locality: Mexico.

Distribution: Mexico.

We have not seen this plant, but we have examined the illustration which accompanies the original description. L. Quehl has had it in cultivation, and sent us a photograph.

This must be a very distinct species and not at all closely related to *Mammillaria dolichocentra*, to which Schumann referred it as a variety, crediting himself as the authority; the name, however, had been used by Förster in 1846. The illustrations in Förster's Handbuch der Cacteenkunde and in Nicholson's Dictionary cited below probably are not to be referred here and they certainly should not be referred to *Mammillaria dolichocentra*.

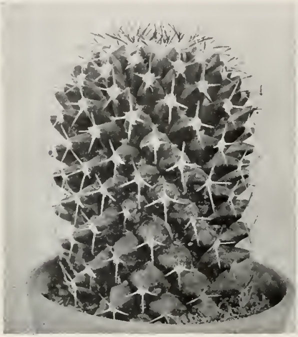
FIG. 106.—Neomammillaria kewensis.

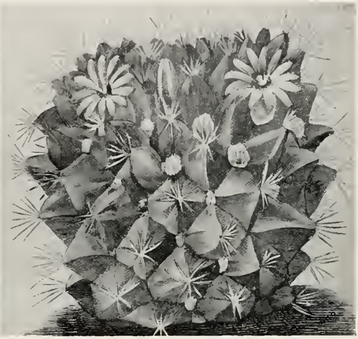
FIG. 107.—Neomammillaria subpolyedra.

Mammillaria obscura galeottii Salm-Dyck (Förster, Handb. Cact. 213. 1846) is mentioned as a synonym of this species, but so far as we can learn it was never described.

Illustrations: Hort. Belge 4: pl. 6; Rother, Praktischer Leitfaden Kakteen 37, as *Mammillaria galeottii;* Förster, Handb. Cact. ed. 2. 323. f. 32; Dict. Gard. Nicholson **2**: 321. f. 508, as *Mammillaria dolichocentra.*

59. Neomammillaria tetracantha (Salm-Dyck).

Mammillaria tetracantha Salm-Dyck in Pfeiffer, Enum. Cact. 18. 1837.
Mammillaria obconella Scheidweiler, Hort. Belge *4:* 93. 1837.
Mammillaria dolichocentra Lemaire, Cact. Aliq. Nov. 3. 1838.
Mammillaria dolichocentra staminea Labouret, Monogr. Cact. 50. 1853.
Cactus obconella Kuntze, Rev. Gen. Pl. *1:* 259. 1891.
Cactus dolichocentrus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus tetracanthus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Mammillaria rigidispina Hildmann, Monatsschr. Kakteenk. *3:* 112. 1893.
Mammillaria dolichocentra brevispina Rünge, Monatsschr. Kakteenk. *3:* 112. 1893.

Nearly globular, 6 to 8 cm. in diameter; axils of tubercles with scanty persistent wool; tubercles 8 to 10 mm. long, obscurely 4-angled; areoles small, at first lanate, somewhat 4-angled; spines 4, all radial, slender, the 3 lower equal, the upper one incurved, longer, 25 mm. long, when young all yellowish white, in age grayish yellow or brown; flowers numerous from towards top of plant, small, pinkish to rose-colored; inner perianth-segments narrowly lanceolate, acuminate.

Type locality: Mexico, but no definite locality cited.

Distribution: Mexico, but range unknown.

Schumann refers here *Mammillaria longispina* Reichenbach (Suppl. Terscheck Cact. Verz.; see also Walpers, Repert. Bot. 2: 301. 1843) and *M. obconella* Scheidweiler (Hort. Belge 4: 93. f. 6. 1837), but we are uncertain as to their relationship. To the former Walpers refers as a synonym *M. galeottii* Otto.

Mammillaria dolichacantha Lemaire (Förster, Handb. Cact. 213. 1846) and *M. dolichocentra picta* (Salm-Dyck, Cact. Hort. Dyck. 1844. 9. 1845) were never described.

Illustrations: Curtis's Bot. Mag. 70: pl. 4060, as *Mammillaria tetracantha;* Cassell's Dict. Gard. 2: 48; Karsten, Deutsche Fl. 887. f. 501, No. 2; ed. 2. 2: 456. f. 605, No. 2; Schelle, Handb. Kakteenk. 260. f. 182; Watson, Cact. Cult 155. f. 58; ed. 3. f. 36; Lemaire, Icon. Cact. pl. 5; Schumann, Gesamtb. Kakteen 558. f. 91; Förster, Handb. Cact. ed. 2. 322. f. 31; Gartenwelt 9: 265; Lemaire, Cactées 37. f. 3, as *Mammillaria dolichocentra;* Rev. Hort. 1861: 270. f. 72, as *Mammillaria;* Thomas, Zimmerkultur Kakteen 54; Monatsschr. Kakteenk. 3: 113, as *Mammillaria rigidispina.*

Figure 108 is a reproduction of the first illustration cited above.

60. Neomammillaria elegans (De Candolle).

Mammillaria geminispina[*] De Candolle, Mém. Mus. Hist. Nat. Paris *17:* 30. 1828. Not Haworth, 1824.
Mammillaria elegans De Candolle, Mém. Mus. Hist. Nat. Paris *17:* 111. 1828.
Mammillaria elegans minor De Candolle, Mém. Mus. Hist. Nat. Paris *17:* 111. 1828.
?*Mammillaria elegans globosa* De Candolle, Mém. Mus. Hist. Nat. Paris *17:* 111. 1828.
Mammillaria acanthophlegma Lehmann, Del. Sem. Hamb. 1832.
Mammillaria supertexta Martius in Pfeiffer, Enum. Cact. 25. 1837.
Mammillaria dyckiana Zuccarini in Pfeiffer, Enum. Cact. 26. 1837.
Mammillaria elegans micrantha Lemaire, Cact. Gen. Nov. Sp. 100. 1839.
Mammillaria geminispina tetracantha Lemaire, Cact. Gen. Nov. Sp. 100. 1839.
Mammillaria klugii Ehrenberg, Bot. Zeit. *2:* 834. 1844.
Mammillaria meisneri Ehrenberg, Bot. Zeit. *2:* 834. 1844.
Mammillaria kunthii Ehrenberg, Bot. Zeit. *2:* 835. 1844.
Mammillaria splendens Ehrenberg, Allg. Gartenz. *17:* 242. 1849.
Mammillaria acanthophlegma decandollii Salm-Dyck, Cact. Hort. Dyck. 1849. 9. 1850.
Mammillaria elegans klugii Salm-Dyck, Cact. Hort. Dyck. 1849. 9. 1850.
Mammillaria acanthophlegma meisneri Salm-Dyck, Cact. Hort. Dyck. 1849.9. 1850.
Mammillaria supertexta tetracantha Salm-Dyck in Labouret, Monogr. Cact. 61. 1853.
Mammillaria acanthophlegma elegans Monville in Labouret, Monogr. Cact. 63. 1853.
Mammillaria acanthophlegma monacantha Monville in Labouret, Monogr. Cact. 63. 1853.
Mammillaria acanthophlegma leucocephala Monville in Labouret, Monogr. Cact. 63. 1853.
Mammillaria acanthophlegma abducta Monville in Labouret, Monogr. Cact. 64. 1853.
Cactus acanthophlegma Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus dyckianus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus elegans Kuntze, Rev. Gen. Pl. *1:* 260. 1891. Not Link, 1822.
Cactus kunthii Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus klugii Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus meissneri Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus supertextus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Simple, obovate to globose, 5 cm. in diameter, somewhat umbilicate at apex; tubercles ovate, naked in their axils, not lactiferous; spine-areoles tomentose when young; radial spines stiff, bristle-like, 25 to 30, white, spreading; central spines 1 (sometimes 2 or 3), rigid.

Type locality: Mexico.

Distribution: Central Mexico.

This species was based on Thomas Coulter's No. 48 from Mexico but no definite locality was cited. The type was not preserved nor is there any illustration extant of the original. De Candolle may have had more than one species before him when he drew up his description, for he described two varieties, one of which has bristles in the axils of the tubercles, which are never found in *Neomammillaria elegans* as we have treated it here.

Plants named *Mammillaria elegans* are to be found in most collections of cacti, but the name is often applied to several closely allied species. A plant from northern Mexico, *Mammillaria chinocephala*, resembles it very much but has milky tubercles. Other species which have passed as *M. elegans* have recently been described as *Mammillaria pseudoperbella* and *M. perbella.*

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[*] Here De Candolle referred *Cactus columnaris* Mociño and Sessé (De Candolle, Prodr. *3:* 459. 1828), which Schumann has inadvertently taken up as *Mammillaria columnaris* Mociño and Sessé (Gesamtb. Kakteen 565. 1898).

Mammillaria supertexta caespitosa Monville (Salm-Dyck, Cact. Hort. Dyck. 1844. 6. 1845) is only a name; *M. supertexta compacta* Scheidweiler (Labouret, Monogr. Cact. 61. 1853) was given as a synonym of *M. supertexta tetracantha* but may not belong here.

The name *Mammillaria leucocephala* Hortus is given by Pfeiffer as a synonym of *M. acanthophlegma. M. recta* Miquel (Labouret, Monogr. Cact. 63. 1853) occurs only as a synonym for the same species.

Illustrations: Blühende Kakteen **3:** pl. 139; Cact. Journ. **1:** pl. for February; Schelle, Handb. Kakteenk. 261. f. 183; Schumann, Gesamtb. Kakteen 564. f. 92, as *Mammillaria elegans;* Mém. Mus. Hist. Nat. Paris **17:** pl. 3, as *Mammillaria geminispina;* Cact. Journ. **1:** pl. for February in part, as *Mammillaria supertexta;* Möllers Deutsche Gärt. Zeit. **25:** 475. f. 8, No. 24, as *Mammillaria dyckiana.*

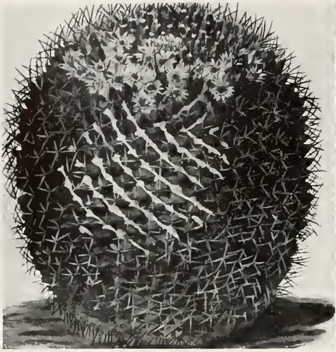


FIG. 108.—Neomammillaria tetracantha.

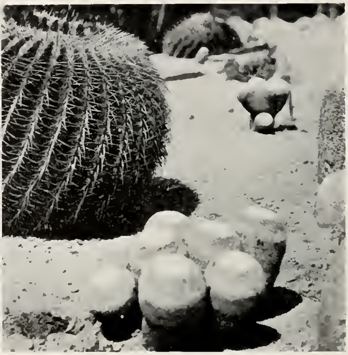


FIG. 109.—Neomammillaria elegans.

Figure 109 is from a photograph of the plant grown in the Huntington Collection near Los Angeles, California, as this species.

Of this relationship are the following:

MAMMILLARIA CONSPICUA J. A. Purpus, Monatsschr. Kakteenk. **22:** 163. 1912.

Simple, cylindric to globose, not milky; spine-areoles small, short-elliptic, when young a little woolly, in age glabrate; radial spines 10 to 25, rigid; central spines 2, a little curved; fruit red; seeds 1 mm. long.

Type locality: Near Zapotitlán, Puebla, Mexico.

Illustration: Monatsschr. Kakteenk. **24:** 37.

MAMMILLARIA MICROTHELE Mühlenpfordt, Allg. Gartenz. **16:** 11. 1848.

Cactus bispinus Coulter, Contr. U. S. Nat. Herb. *3:* 101. 1894.

Cespitose, many-headed; joints globose, small; tubercles when dry 6 mm. long, naked or woolly in their axils; radial spines 22 to 24, white-setiform, spreading, 2 to 4 mm. long; central spines 2, much stouter than the radials, 2 mm. long or less; flowers flesh-colored without, white within, small, only 3 to 4 mm .long when dried; fruit clavate, 10 mm. long; seeds rather large, probably black.

Type locality: Not known but supposed to be Mexico.

Distribution: Mexico.

Our description is drawn from the original, supplemented by specimens in the Engelmann Herbarium obtained from Salm-Dyck's garden in January 1857, which consist of two packets, one containing a few spine-clusters and the other several withered flowers and nearly ripe fruits; these latter are labeled "Baumann 857." Engelmann and Coulter compare this species with *Mammillaria micromeris* but we believe that it is related to *M. elegans* and its allies.

It seems to have been described from specimens of Haage of unknown origin but supposed to be from Mexico; Coulter's reference, on the statement of Budd, that it occurs within the southern border of Pecos County, Texas, is to be doubted.

Coulter renamed *Mammillaria microthele* because of an older *Cactus microthele.* Martius used the name *M. microthele* in 1829 (Hort. Reg. Monac. 127) but without description. The names *M. brongniartii* Hortus, *M. microthele brongniartii,* and *M. compacta* Hortus (not Engelmann, 1848) have been used (Salm-Dyck, Cact. Hort. Dyck. 1849. 9. 1850) but without descriptions.

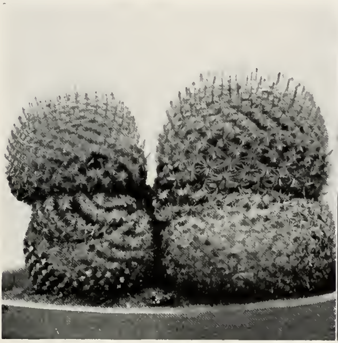


FIG. 110.—Neomammillaria pseudoperbella.

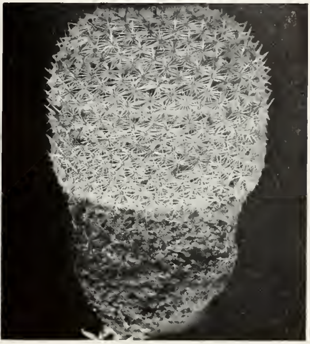


FIG. 111.—Neomammillaria dealbata.

61. Neomammillaria pseudoperbella (Quehl).

Mammillaria pseudoperbella Quehl, Monatsschr. Kakteenk. *19:* 188. 1909.
Mammillaria pseudoperbella rufispina Quehl, Monatsschr. Kakteenk. *26:* 94. 1916.

Solitary, or few together, globose to short-cylindric, very spiny, depressed at apex; tubercles short-cylindric; radial spines 20 to 30, setaceous, white, short; central spines 2, one erect, the other turned backwards; flowers small, purple; perianth-segments narrow-oblong, with an ovate acute tip; style longer than the filaments, pinkish; stigma-lobes 3, obtuse.

Type locality: Mexico.

Distribution: Central Mexico.

The flowers of this plant were not known when first described nor was its exact origin known. An illustration of it was given. We have also received a dead plant from Bödeker. This illustration and specimen seem to point to a species which has been frequently sent to us from Oaxaca by Conzatti, Reko, and Solís. These plants from Oaxaca normally have 2 short, stout, divergent, central spines. In one specimen sent by Professor Conzatti in 1922 the central spines are often 2 and 4, with one of the centrals more elongated and those near the top of the plant connivent.

Illustration: Monatsschr. Kakteenk. 19: 189, as *Mammillaria pseudoperbella.*

Plate XII, figure 1, shows a plant sent by C. Conzatti from Oaxaca, in 1921. Figure 110 is from a photograph of the type specimen.

62. Neomammillaria dealbata (Dietrich).

Mammillaria dealbata Dietrich, Allg. Gartenz. *14:* 309. 1846.
Cactus dealbatus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

Globose to short-cylindric, glaucous, more or less depressed at apex but almost hidden by the many closely appressed spine-clusters; axils of tubercles and young spine-areoles densely lanate but in age glabrate; radial spines about 20, white, short, appressed; central spines 2, much stouter and longer than the radials, sometimes 1 cm. long, the upper ones often erect, white below, brown or black at tip; flowers small, carmine; fruit clavate, red; seeds brown.

Type locality: Mexico.

Distribution: Central Mexico, especially on the pedregal about the City of Mexico.

We have referred to this species a plant which is very common in the Valley of Mexico and which is known in collections as *Mammillaria peacockii*. The name, first used by Rümpler (Förster, Handb. Cact. ed. 2. 286. 1885), was given as a synonym of *Mammillaria dealbata*. It was offered for sale by Grässner as *M. elegans dealbata* (Monatsschr. Kakteenk. February 1920).

Illustration: Grässner, Haupt-Verz. Kakteen **1912:** 23, as *Mammillaria peacockii.*

Plate XII, figure 3, shows a plant from Mexico, sent to the New York Botanical Garden in 1911. Figure 111 is from a photograph of a plant sent by Dr. Reiche from the Valley of Mexico in 1922.

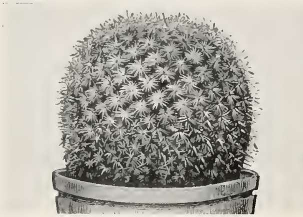


FIG. 112.—Neomammillaria haageana.

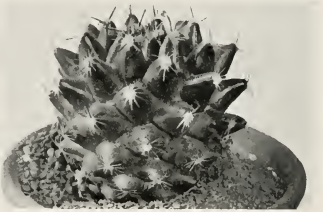


FIG. 113.—Neomammillaria mundtii.

63. Neomammillaria haageana (Pfeiffer).

Mammillaria haageana Pfeiffer, Allg. Gartenz. *4:* 257. 1836.
Mammillaria diacantha Haage in Steudel, Nom. ed. 2. *2:* 96. 1841. Not Lemaire, 1838.
Mammillaria haageana validior Monville in Labouret, Monogr. Cact. 54. 1853.
Cactus haageanus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

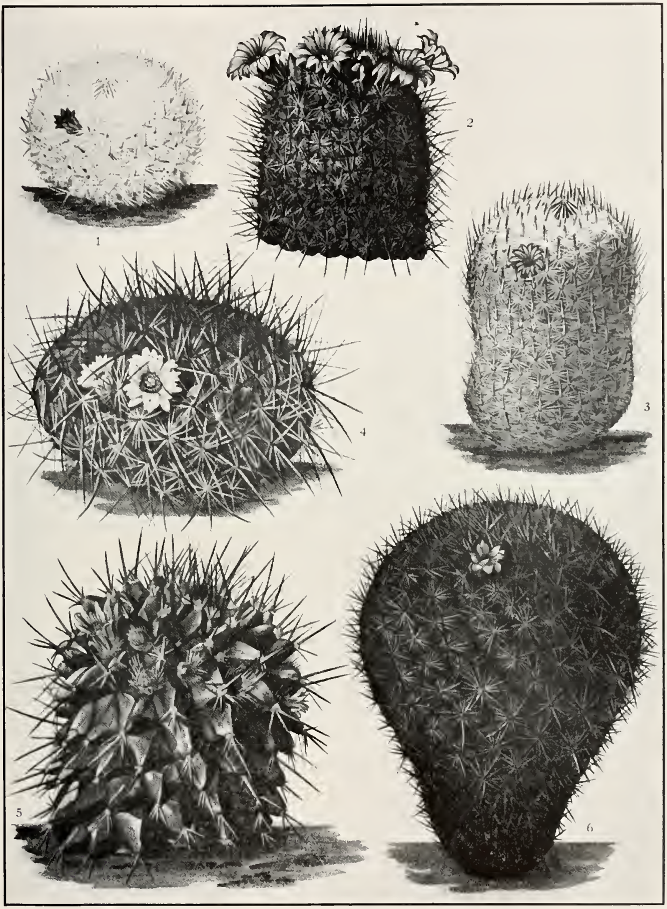
Somewhat cespitose, the individual plants globose or somewhat elongated in age; axils slightly woolly; radial spines about 20, radiating, white; central spines 2, a little longer than the radials, black; flowers small, carmine-rose.

Type locality: Mexico.

Distribution: Mexico, but range unknown.

Pfeiffer (Enum. Cact. 26. 1837) refers here *Mammillaria diacantha nigra* which Haage had listed in his Catalogue of 1836. Here Pfeiffer also refers *M. perote* (Allg. Gartenz. **4:** 257. 1836) of gardens.

Illustrations: Dict. Gard. Nicholson **2:** 321. f. 509; Cact. Journ. **1:** 165; Knippel, Kakteen f. 21; Förster, Handb. Cact. ed. 2. 284. f. 29; Watson, Cact. Cult. 163. f. 62; ed. 3. f. 39; Schelle, Handb. Kakteenk. 262. f. 184; Rümpler, Sukkulenten 201. f. 114, as *Mammillaria haageana.*



1. Flowering plant of *Neomammillaria pseudoperbella.*
2. Top of flowering plant of *Neomammillaria spinosissima.*
3. Flowering plant of *Neomammillaria dealbata.*
4. Flowering plant of *Neomammillaria amoena.*
5. Flowering plant of *Neomammillaria polyedra.*
6. Flowering plant of *Neomammillaria celsiana.*

(All three-fourths size.)

Figure 112 is reproduced from the first illustration cited above. Nicholson recorded the receipt of the plant figured by him from Haage.

64. Neomammillaria perbella (Hildmann).

Mammillaria perbella Hildmann in Schumann, Gesamtb. Kakteen 567. 1898.

Solitary or somewhat cespitose, depressed-globose, glaucous-green; tubercles short-conic, their axils lanate; radial spines 14 to 18, 1 to 1.5 mm. long, setaceous, white; central spines 2, very short (4 to 6 mm. long); flowers 9 to 10 mm. long, reddish; stigma-lobes red.

Type locality: Mexico.

Distribution: Mexico, but range unknown.

We know this species from description only; Schumann places it near *Mammillaria donatii.*

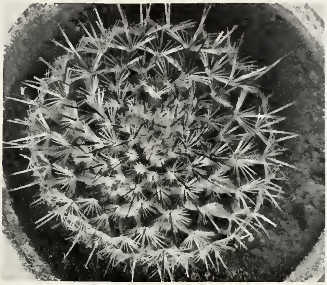


FIG. 114.—Neomammillaria donatii.

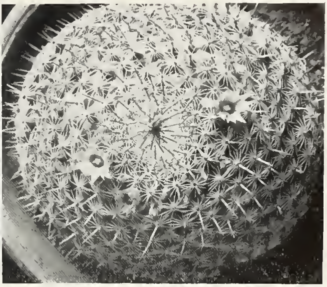


FIG. 115.—Neomammillaria collina.

65. Neomammillaria collina (J. A. Purpus).

Mammillaria collina J. A. Purpus, Monatsschr. Kakteenk. 22: 162. 1912.

Solitary, globose, 12 to 13 cm. in diameter, somewhat depressed at apex; tubercles cylindric, 1 cm. long or less, woolly in their axils; radial spines 16 to 18, white, 4 mm. long; central spines 1 or 2, longer than the radials; flowers rose-colored, 1.5 to 2 cm. long; fruit 2 cm. long, red.

Type locality: Esperanza, Puebla, Mexico.

Distribution: Puebla, Mexico.

We refer here specimens collected near the type locality in 1912 by Dr. C. A. Purpus.

Illustrations: Monatsschr. Kakteenk. **23:** 99; Grässner, Haupt-Verz. Kakteen **1914:** 28, as *Mammillaria collina.*

Figure 115 shows a plant sent by Dr. Purpus to Washington.

66. Neomammillaria donatii (Berge).

Mammillaria donatii Berge in Schumann, Gesamtb. Kakteen Nachtr. 135. 1903.

Usually simple, stout and globose, but sometimes cespitose, glaucous-green; tubercles small, conic, naked in their axils; radial spines 16 to 18, 8 mm. long, glassy; central spines 2, yellowish black, 10 mm. long; flowers reddish, 15 mm. long; style and stigma-lobes white.

Type locality: Mexico.

Distribution: Mexico.

We do not know the exact type locality or distribution of this plant. It is now in the trade and we recently obtained a specimen from Haage and Schmidt.

Figure 114 is from a photograph of the plant received from Haage and Schmidt in 1920, referred to above.

67. Neomammillaria mundtii (Schumann).

Mammillaria mundtii Schumann, Monatsschr. Kakteenk. *13:* 141. 1903.

Solitary, so far as known, globose, 6 to 7 cm. in diameter; tubercles not milky, nearly terete, dark green, rather short and stubby, their axils naked; spine-areoles circular, somewhat lanate when young; radial spines 8 to 19, swollen at base, spreading or somewhat curved backward, 6 to 8 mm. long, brownish when young, the tips usually darker; central spines 2, a little stouter and longer than the radials, porrect; flower from toward the center of the plant, 2 cm. long.

Type locality: Not cited.

Distribution: Mexico, but known only from cultivated plants.

We know this plant from a specimen sent to Washington in 1921 by W. Mundt, in whose honor the species had been named.

Illustration: Monatsschr. Kakteenk. **13:** 142, as *Mammillaria mundtii.*

Figure 113 is a reproduction of a photograph sent us by L. Quehl in 1921.

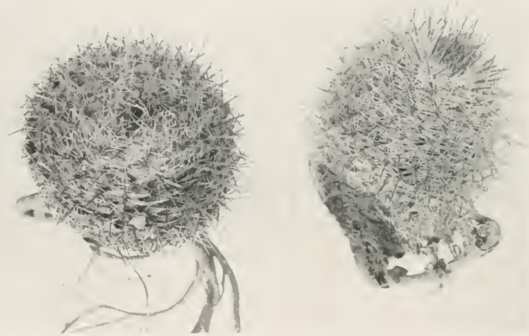


FIG. 116.—Neomammillaria celsiana.

68. Neomammillaria celsiana (Lemaire).

Mammillaria celsiana Lemaire, Cact. Gen. Nov. Sp. 41. 1839.
Mammillaria muehlenpfordtii Förster, Allg. Gartenz. *15:* 49. 1847.
Mammillaria schaeferi Fennel, Allg. Gartenz. *15:* 66. 1847.
Mammillaria schaeferi longispina Haage, Hamb. Gartenz. *17:* 160. 1861.
Cactus muehlenpfordtii Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus celsianus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus schaeferi Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
(?) *Mammillaria perringii* Hildmann, Gartenwelt *10:* 250. 1906.

Plant-body subglobose, becoming cylindric, 10 to 12.5 cm. high, 7.5 cm. in diameter, deep green; axils of tubercles woolly; tubercles conic, compact; spine-areoles small, round, woolly when young; radial spines 24 to 26, about equal, white, setaceous; central spines 4 to 6, rarely 7, somewhat longer than the radials, terete, rigid, pale yellow, more or less recurved and unequal, 8 to 16 mm. long; flowers red; fruit described as green.

Type locality: Not cited.

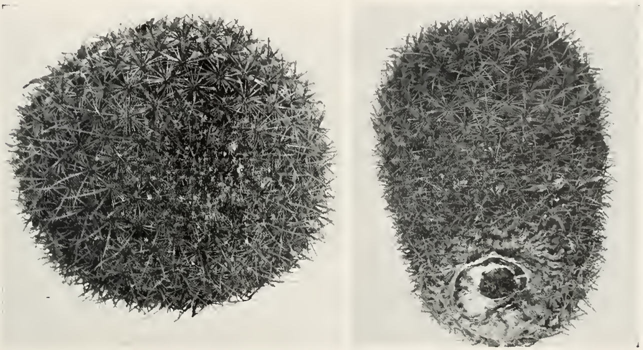
Distribution: Southern Mexico.

In 1920 Professor Conzatti sent us two specimens from the District of Cuicatlán, Oaxaca, which we refer here; these are the only plants of this species we have seen.

According to Salm-Dyck, *Mammillaria celsiana* differs from *M. rutila* in its columnar stem and in its spines.

Schumann refers *Mammillaria perringii* to *M. celsiana*, while Hildmann claims that it is possible that the two may be distinct, but we do not have the material at hand to decide definitely.

Mammillaria lanifera Haworth (Phil. Mag. 63: 41. 1824; *Cactus lanifer* Kuntze, Rev. Gen. Pl. **1**: 260. 1891) is referred here by Schumann; it is probably different but, if not, the name has priority over *M. celsiana*. To *M. lanifera* De Candolle (Prodr. **3**: 459. 1828) refers *Cactus canescens* Mociño and Sessé. *M. geminispina monacantha* Lemaire (Cact. Gen. Nov. Sp. 100. 1839) was supposed to be the same as *M. lanifera*. *Mammillaria polycephala* Mühlenpfordt (Allg. Gartenz. **13**: 347. 1845; *Cactus polycephalus* Kuntze, Rev. Gen. Pl. **1**: 261. 1891) was referred by Schumann to *M. elegans*, but it was described with 4 central spines. It seems to be related to *M. crucigera*, which we have tentatively referred to *M. celsiana*, which has yellow central spines, while both *M. polycephala* and *M. elegans* have white centrals.



FIGS. 117 and 118.—Neomammillaria aureiceps.

Mammillaria supertexta dichotoma (Salm-Dyck, Cact. Hort. Dyck. 1849. 9. 1850) is based on *M. polycephala*.

Mammillaria crucigera Martius (Nov. Act. Nat. Cur. **16**: 340. pl. 25, f. 2. 1832; *Cactus cruciger* Kuntze, Rev. Gen. Pl. **1**: 260. 1891) is related to this species, judging from the description, but the illustration suggests that it is a distinct species. It was collected by Karwinsky in Mexico, but he does not give a definite locality. It was unknown to Schumann.

Illustrations: Gartenwelt **10**: 250; Möllers Deutsche Gärt. Zeit. **25**: 475. f. 8, No. 29, as *Mammillaria celsiana;* Gartenwelt **10**: 250, as *Mammillaria perringii;* ? Mém. Mus. Hist. Nat. Paris **17**: pl. 4, as *Mammillaria lanifera;* ? Martius, Nov. Act. Nat. Cur. **16**: pl. 25, f. 2, as *Mammillaria crucigera.*

Plate XII, figure 6, shows a plant in the New York Botanical Garden which flowered October 16, 1911. Figure 116 is from a photograph of two plants sent by Professor Conzatti in 1920.

69. Neomammillaria aureiceps (Lemaire).

Mammillaria aureiceps Lemaire, Cact. Aliq. Nov. 8. 1838.
Mammillaria rhodantha aureiceps Salm-Dyck, Cact. Hort. Dyck. 1844. 7. 1845.
Cactus aureiceps Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

Globose to short-oblong, 8 to 10 cm. in diameter; tubercles short, terete in section, woolly and setose in their axils; radial spines about 20, bristle-like, white, 5 to 8 mm. long, spreading; central spines several, sometimes as many as 9, yellow, stouter and longer than the radials, 10 to 14 mm. long, somewhat spreading and a little curved inward; flowers small, dark red.

Type locality: Mexico.

Distribution: Valley of Mexico.

Our description is based on specimens recently sent us by Dr. Karl Reiche as *Mammillaria rhodantha,* under which name it usually passes. *M. rhodantha,* however, has different spines and is more strictly a mountain species.

Plate IX, figure 3, shows a plant sent from the Edinburgh Botanical Garden in 1902 as *Mammillaria rhodantha* which flowered in the New York Botanical Garden, October 15, 1912. Figures 117 and 118 give two views of this plant sent us by Dr. Reiche from the Valley of Mexico.

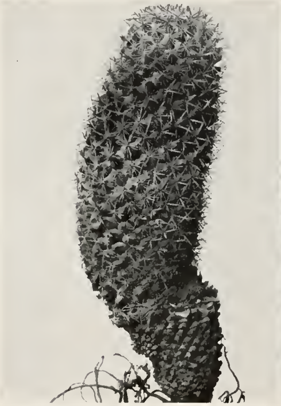


FIG. 119.—Neomammillaria yucatanensis.

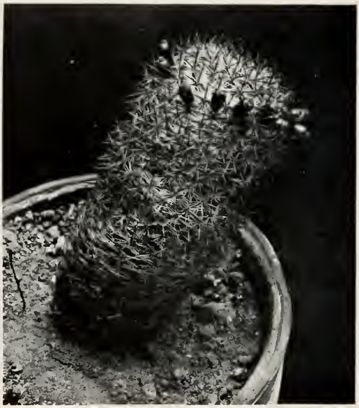


FIG. 120.—Neomammillaria ruestii.

70. Neomammillaria yucatanensis sp. nov.

Plants in clumps of 4, erect, cylindric, not milky, 10 to 15 cm. long, 3 to 6 cm. in diameter, very spiny; tubercles conic, woolly in their axils but not setose; radial spines about 20, white, spreading, acicular; central spines 4 or rarely 5, much stouter than the radials, 6 to 8 mm. long, slightly spreading above, yellowish brown; "flowers very small, rose; fruit oblong, bright red."

Collected by George F. Gaumer at Progreso, Yucatan, Mexico, in 1918 (No. 23939) and again in 1921 (No. 24367, type).

We have not seen this species in flower or fruit but Dr. Gaumer has described them as above. He says that the plant is rare on the land side of the coastal marshes.

Figure 119 is from a photograph of the plant sent in 1921 by Dr. Gaumer.

71. Neomammillaria ruestii (Quehl).

Mammillaria ruestii Quehl, Monatsschr. Kakteenk. *15:* 173. 1905.
Mammillaria celsiana guatemalensis Eichlam, Monatsschr. Kakteenk. *19:* 59. 1909.

Cylindric, 6 to 7 cm. high, 4 to 5 cm. in diameter, light green, almost hidden by the spines; axils of tubercles more or less woolly, at least when young; flowering areoles at first quite woolly; radial spines 20 or more, white, glossy, 5 to 6 mm. long, spreading; central spines usually 4, sometimes 5, much stouter than the radials, yellow, swollen at base, ascending, 7 to 8 mm. long; flowers small, sometimes almost hidden by the spines, 8 mm. long; inner perianth-segments about 25, lanceolate, acute, pale purple, the margins almost colorless; filaments colorless below, purplish above; style pale; stigma-lobes 4, linear, elongated, reflexed; fruit clavate, red; seeds brown.

Type locality: Honduras.

Distribution: Honduras and Guatemala.

We have had the Guatemala plant under observation for 14 years and it has both flowered and fruited.

Figure 120 is from a photograph of a plant sent by Dr. A. W. Kellermann from Guatemala in 1908.

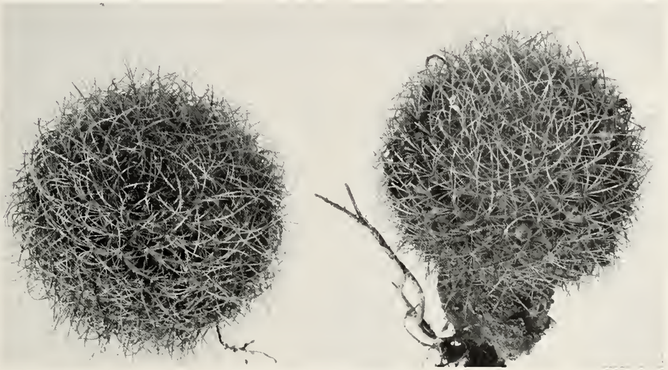


FIG. 121.—Neomammillaria pringlei.

72. Neomammillaria pringlei (Coulter).

Cactus pringlei Coulter, Contr. U. S. Nat. Herb. *3:* 109. 1894.
Mammillaria pringlei K. Brandegee, Zoe *5:* 7. 1900.

Solitary, with long fibrous roots, usually globose, but sometimes depressed or short-cylindric, 6 to 16 cm. high, 6 to 7 cm. in diameter; tubercles dull green, terete, conic, 6 to 10 mm. long; axils of tubercles woolly and setose; spines all yellow; radial spines 18 to 20, setaceous, spreading, 5 to 8 mm. long; central spines 5 to 7, much stouter and longer than the radials, more or less recurved, 2 to 2.5 cm. long, those from the upper areoles curved over the apex of the plant; flowers deep red, 8 to 10 mm. long; fruit borne in a circle near the middle of the plant, oblong, 12 to 15 mm. long; seeds small, brown.

Type locality: Cited as San Luis Potosí, but doubtless Tultenango Canyon, state of Mexico, according to Pringle, who collected the type.

Distribution: Known only from the type locality.

Dr. Rose collected living specimens from the type locality some years ago but these never flowered. In April 1921 we sent Dr. Reiche to the type locality and he obtained thirteen beautiful specimens, one of which was in fruit.

Coulter (Contr. U. S. Nat. Herb. 3: 109. 1894) states that *Cactus pringlei* was near *Cactus rhodanthus sulphureospinus*, which was based on *M. sulphurea* Förster.

Figure 121 is from a photograph of the plants collected at Tultenango Canyon in 1921.

73. **Neomammillaria cerralboa** sp. nov.

Cylindric, solitary, 1 to 1.5 dm. high, 5 to 6 cm. in diameter; tubercles not milky, yellowish, terete, obtuse, closely set; spines all yellow, very much alike, about 11, one usually more central, the longer ones nearly 2 cm. long; flowers small, 1 cm. long or less, forming a circle around the plant about 3cm. below the top.

Collected by Ivan M. Johnston on Cerralbo Island, Gulf of California, June 6, 1921 (No. 4038). The next day on the same island he collected three more plants (No. 4053) which seem to be referable here, except that two of them have hooked spines; Dr. Rose also collected on this same island (No. 16877) in 1911 specimens with hooked spines which are like Mr. Johnston's plant. Whether this plant has normally these two forms or whether the hooked-spined one is a hybrid we are unable to determine.

Figure 121*a* is a photograph of the type plant, collected by Johnston (No. 4038).

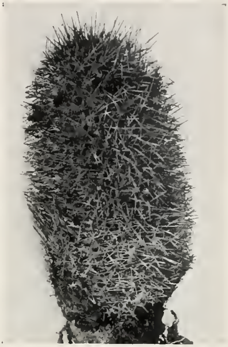


FIG. 121*a*.—Neomammillaria cerralboa.

74. **Neomammillaria phaeacantha** (Lemaire).

Mammillaria phaeacantha Lemaire, Cact. Gen. Nov. Sp. 47. 1839.
Mammillaria nigricans Fennel, Allg. Gartenz. *15:* 66. 1847.
Cactus nigricans Kuntze, Rev. Gen. Pl. *1:* 261. 1891. Not Haworth, 1803.
Cactus phaeacanthus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

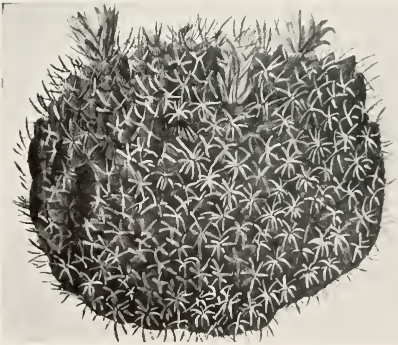


FIG. 122.—Neomammillaria phaeacantha.

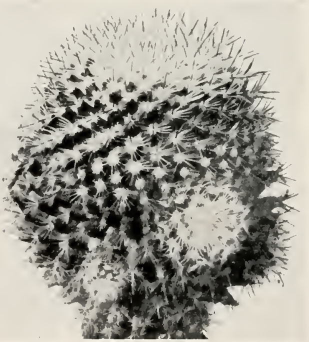


FIG. 123.—Neomammillaria graessneriana.

Globose or somewhat depressed, green; axils of tubercles woolly; tubercles conic, hardly, if at all, angled; spine-areoles small, yellowish tomentose (probably so only when young); radial spines 16 to 20, white, setaceous; central spines 4, black, subulate, spreading or reflexed, the lowest one longest; flowers from upper part of plant, dark red; perianth-segments oblong, acuminate.

Type locality: Mexico.

Distribution: Mexico, but range unknown.

This species has not been recognized by recent writers, and while we have seen no specimens we believe it deserves specific rank.

Schumann refers *Mammillaria nigricans* definitely to *M. rhodantha* but, it appears to us, without justification; the Index Kewensis has referred it, we believe properly, to *M. phaeacantha.*

Mammillaria phaeacantha rigidior (Salm-Dyck, Cact. Hort. Dyck. 1844. 8. 1845) is only a name.

Illustration: Pfeiffer, Abbild. Beschr. Cact. **2:** pl. 23, as *Mammillaria nigricans.*

Figure 122 is reproduced from the illustration cited above.

75. Neomammillaria graessneriana (Bödeker).

Mammillaria graessneriana Bödeker, Monatsschr. Kakteenk. *30:* 84. 1920.

Solitary, or becoming cespitose, globose, 6 to 8 cm. in diameter, dark bluish green, somewhat depressed at apex; tubercles 4-angled, 8 mm. long, not milky, obtuse or truncate at apex, not setose in their axils; spine-areoles circular, white-woolly when young, nearly naked in age; radial spines 18 to 20, acicular, 6 to 8 mm. long, white; central spines 2 to 4, stouter than the radials, spreading, 8 mm. long, reddish brown; flowers small, somewhat distant from the apex of the plant.

Type locality: Mexico.

Distribution: Mexico, but range unknown.

Illustration: Monatsschr. Kakteenk. **30:** 85, as *Mammillaria graessneriana.*

Figure 123 is reproduced from the illustration cited above.

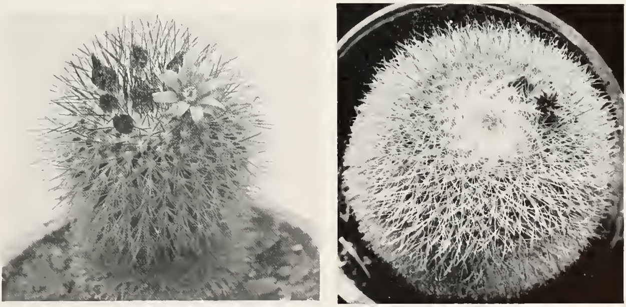


FIG. 124 and 125.—Neomammillaria spinosissima.

76. Neomammillaria spinosissima (Lemaire).

Mammillaria spinosissima Lemaire, Cact. Aliq. Nov. 4. 1838.
Mammillaria polycentra Berg, Allg. Gartenz. *8:* 130. 1840.
Mammillaria auricoma Dietrich, Allg. Gartenz. *14:* 308. 1846.
Mammillaria polyacantha Ehrenberg, Allg. Gartenz. *16:* 265. 1848.
Mammillaria polyactina Ehrenberg, Allg. Gartenz. *16:* 266. 1848.
Mammillaria hepatica Ehrenberg, Allg. Gartenz. *16:* 267. 1848.
Mammillaria pomacea Ehrenberg, Allg. Gartenz. *16:* 267. 1848.
Mammillaria pulcherrima Ehrenberg, Allg. Gartenz. *17:* 249. 1849.
Mammillaria pretiosa Ehrenberg, Allg. Gartenz. *17:* 250. 1849.

Mammillaria caesia Ehrenberg, Allg. Gartenz. *17:* 251. 1849.
Mammillaria mirabilis Ehrenberg, Allg. Gartenz. *17:* 251. 1849.
Mammillaria pruinosa Ehrenberg, Allg. Gartenz. *17:* 261. 1849.
Mammillaria seegeri Ehrenberg, Allg. Gartenz. *17:* 261. 1849.
Mammillaria haseloffii Ehrenberg, Allg. Gartenz. *17:* 303. 1849.
Mammillaria herrmannii Ehrenberg, Allg. Gartenz. *17:* 303. 1849.
Mammillaria aurorea Ehrenberg, Allg. Gartenz. *17:* 303. 1849.
Mammillaria linkeana Ehrenberg, Allg. Gartenz. *17:* 308. 1849.
Mammillaria vulpina Ehrenberg, Allg. Gartenz. *17:* 308. 1849.
Mammillaria eximia Ehrenberg, Allg. Gartenz. *17:* 309. 1849.
Mammillaria isabellina Ehrenberg, Allg. Gartenz. *17:* 309. 1849.
Mammillaria spinosissima brunnea Salm-Dyck, Cact. Hort. Dyck. 1849. 8. 1850.
Mammillaria spinosissima flavida Salm-Dyck, Cact. Hort. Dyck. 1849. 8. 1850.
Mammillaria spinosissima rubens Salm-Dyck, Cact. Hort. Dyck. 1849. 8. 1850.
Mammillaria herrmanni flavicans Salm-Dyck, Cact. Hort. Dyck. 1849. 8. 1850.
Mammillaria seegeri gracilispina Salm-Dyck, Cact. Hort. Dyck. 1849. 8. 1850.
Mammillaria seegeri pruinosa Salm-Dyck, Cact. Hort. Dyck. 1849. 8. 1850.
Mammillaria uhdeana Salm-Dyck, Cact. Hort. Dyck. 1849. 83. 1850.
Mammillaria spinosissima hepatica Labouret, Monogr. Cact. 35. 1853.
Mammillaria castaneoides Lemaire in Labouret, Monogr. Cact. 37. 1853.
Mammillaria seegeri mirabilis Labouret, Monogr. Cact. 37. 1853.
Mammillaria sanguinea Haage jr. in Regel, Act. Hort. Petrop. *8:* 276. 1883.
Mammillaria poselgeriana Haage in Förster, Handb. Cact. ed. 2. 269. 1885.
Mammillaria pretiosa cristata Hildmann in Förster, Handb. Cact. ed. 2. 273. 1885.
Cactus auricomus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus auroreus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus eximius Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus isabellinus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus linkeanus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus mirabilis Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus polycentrus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus pomaceus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus pretiosus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus pulcherrimus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus spinosissimus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus vulpinus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Mammillaria spinosissima sanguinea Haage in Brandegee, Cycl. Amer. Hort. Bailey *2:* 976. 1900.
Mammillaria spinosissima aurorea Gürke, Blühende Kakteen *2:* under pl. 71. 1905.
Mammillaria spinosissima auricoma Gürke, Blühende Kakteen *2:* under pl. 71. 1905.
Mammillaria spinosissima eximia Gürke, Blühende Kakteen *2:* under pl. 71. 1905.
Mammillaria spinosissima haseloffii Gürke, Blühende Kakteen *2:* under pl. 71. 1905.
Mammillaria spinosissima herrmannii Gürke, Blühende Kakteen *2:* under pl. 71. 1905.
Mammillaria spinosissima isabellina Gürke, Blühende Kakteen *2:* under pl. 71. 1905.
Mammillaria spinosissima linkeana Gürke, Blühende Kakteen *2:* under pl. 71. 1905.
Mammillaria spinosissima mirabilis Gürke, Blühende Kakteen *2:* under pl. 71. 1905.
Mammillaria spinosissima pruinosa Gürke, Blühende Kakteen *2:* under pl. 71. 1905.
Mammillaria spinosissima pulcherrima Gürke, Blühende Kakteen *2:* under pl. 71. 1905.
Mammillaria spinosissima seegeri Gürke, Blühende Kakteen *2:* under pl. 71. 1905.
Mammillaria spinosissima vulpina Gürke, Blühende Kakteen *2:* under pl. 71. 1905.

Cylindric, 7 to 30 cm. long, 2.5 to 10 cm. in diameter, almost hidden under a dense covering of spines; axils of tubercles setose; tubercles very short, 2 to 3 mm. long; spines brownish to red, usually weak, hardly pungent; radial spines about 20, 1 cm. long or less; central spines 7 or 8, 2 cm. long or more; flowers from the upper part of the plant, purplish, 12 mm. long; inner perianth-segments acute; filaments much shorter than the perianth-segments, purple.

Type locality: Not cited.

Distribution: Mountains of central Mexico.

The above description is drawn from collections obtained in the high mountains between the City of Mexico and Cuernavaca. There seems to be little doubt but that they are the *M. sanguinea* Haage which Schumann refers to *M. spinosissima.*

We are disposed to refer here *Echinocactus spinosissimus* (Forbes, Journ. Hort. Tour Germ. 152. 1837). Forbes did not have much knowledge of the cacti but was the gardener of the Duke of Bedford, who sent him to the Continent of Europe in 1835, where he obtained many cacti and on his return to England published a list of them, sometimes with brief descriptions. The names had been given to him by Pfeiffer and others who were studying this family. As he published his list very promptly after his return to England many names appear there first or in the same year as in Pfeiffer's Enumeratio. *Mammillaria spinosissima* may have been in cultivation at the time of Forbes's visit to Germany, for it was published in 1838.

Illustrations: Möllers Deutsche Gärt. Zeit. **25:** 475. f. 8. No. 26, as *Mammillaria poselgeriana;* Gartenflora **32:** pl. 1111; Dict. Gard. Nicholson **2:** 322. f. 510; Förster, Handb. Cact. ed. 2. 271. f. 28; Watson, Cact. Cult. 172. f. 68; ed. 3. f. 46, as *Mammillaria sanguinea;* Möllers Deutsche Gärt. Zeit. **25:** 475. f. 8. No. 11, as *Mammillaria eximia;* Möllers Deutsche Gärt. Zeit. **25:** 475. f. 8, No. 18, as *Mammillaria spinosissima auricoma;* Balt. Cact. Journ. **2:** 150, as *M. spinosissima brunnea;* Möllers Deutsche Gärt. Zeit. **25:** 487. f. 21; Cact. Journ. **2:** 93; Blanc, Cacti 74. No. 1580; Schelle, Handb. Kakteenk. 253. f. 174; Blühende Kakteen **2:** pl. 71, as *Mammillaria spinosissima.*

Plate XII, figure 2, shows a plant collected by Dr. Rose at El Parque, Mexico, in 1906. Figure 124 is from a photograph of a plant sent to the New York Botanical Garden by Frank Weinberg in 1906 as *Cactus spinossimus;* figure 125 is from a photograph of a plant sent by William Brockway from the mountains above the City of Mexico.

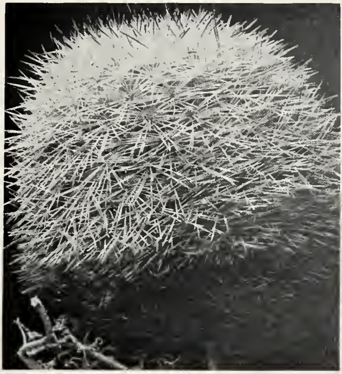


FIG. 126.—Neomammillaria densispina.

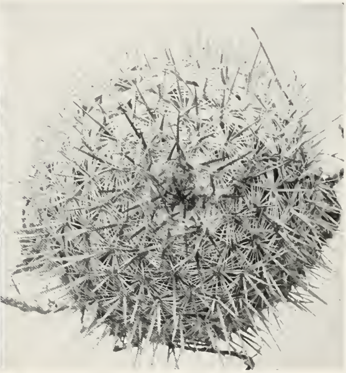


FIG. 127.—Neomammillaria nunezii.

77. Neomammillaria densispina (Coulter).

Cactus densispinus Coulter, Contr. U. S. Nat. Herb. *3:* 96. 1894.
Mammillaria pseudofuscata Quehl, Monatsschr. Kakteenk. *24:* 114. 1914.

Globose, 6 to 10 cm. in diameter, entirely hidden by the dense covering of spines; tubercles short and thick, green, not milky; radial spines 25 or more, slightly spreading, about 1 cm. long, whitish or pale yellow; central spines 5 or 6, longer than the radials, 10 to 12 mm. long, the upper half or third dark brown; flowers purple without, yellowish within, 1.5 cm. long; seeds obovate, reddish brown, 1 mm. in diameter.

Type locality: San Luis Potosí, Mexico.

Distribution: San Luis Potosí, Mexico.

We have had this plant in cultivation since 1912, specimens having been sent to Washington by Mrs. Irene Vera from San Luis Potosí. Our plant is probably a part of the type collection of Quehl's *Mammillaria pseudofuscata*, as Mrs. Vera wrote us that she had sent specimens to Germany which had been identified as *M. fuscata.* Our plant has been compared with Eschanzier's specimen from the same locality which is the type of Coulter's *Cactus desispinus* and we are convinced that they are the same; Coulter's type is now in the Field Museum of Natural History.

Illustration: Monatsschr. Kakteenk. **24:** 115, as *Mammillaria pseudofuscata.*

Figure 126 shows the plant sent by Mrs. Vera from San Luis Potosí.

78. **Neomammillaria nunezii** sp. nov.

Globose to cylindric, 1.5 cm. long, 6 to 8 cm. in diameter; tubercles closely set, short, terete in section, setose in their axils; radial spines white, stiff, about 30, widely spreading; central spines 2 to 4, stout, 10 to 15 mm. long, brown to nearly blackish at tips; fruit 2.5 cm. long, clavate, white or tinged with pink; seeds small, brown.

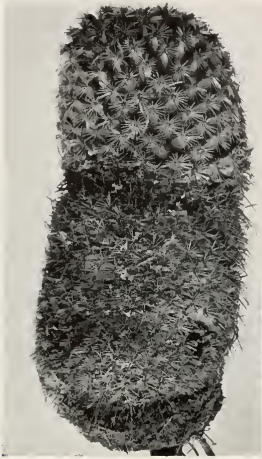


Fig. 128.—Neomammillaria nunezii.

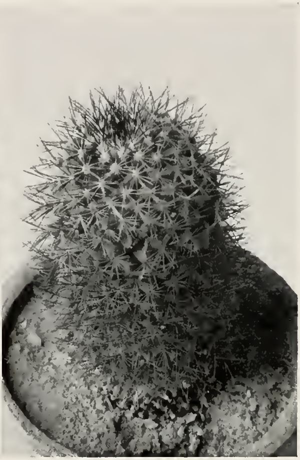


Fig. 129.—Neomammillaria rhodantha.

Collected by Professor C. Núñez at Buenavista de Cuellar, Guerrero, Mexico, in 1921 (Nos. 1, 2 and 3), and communicated to us by Octavio Solís. This species is rather variable in habit and spines and is very unlike any thing that we have heretofore studied.

Figures 127 and 128 are from photographs of the top and side of two plants of this collection.

79. **Neomammillaria amoena** (Hoppfer).

Mammillaria amoena Hoppfer in Salm-Dyck, Cact. Hort. Dyck. 1849. 99. 1850.

Stems robust, columnar; tubercles green, ovoid, obtuse, subglaucous; radial spines 16, slender, radiating, white; central spines 2, rigid, yellowish brown, 8 to 10 mm. long, the upper one longer and recurved; flowers appearing from axils above middle of plant, 2 cm. long; tube cone-shaped, green; outer perianth-segments somewhat brownish; inner perianth-segments with a pale-brown central stripe; margins nearly white, obtuse, entire; stamens short; filaments pale; anthers red; style pale green; stigma-lobes green, linear.

Type locality: Not cited.

Distribution: Central Mexico.

Förster's Handbuch (254. 1846) is often given as the place of publication, but while the name is found in the place cited it is without description.

Plate XII, figure 4, shows a plant which flowered in the New York Botanical Garden in 1912, sent from Cuernavaca, Mexico, by Wm. Brockway the preceding year. Figure 130 is from a photograph of a plant from the same collection which flowered in Washington.

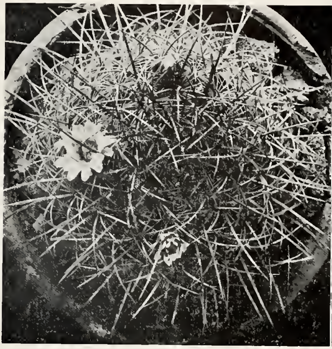


Fig. 130.—Neomammillaria amoena.

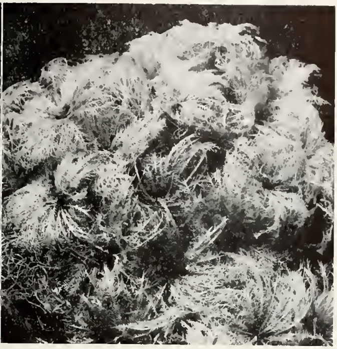


Fig. 131.—Neomammillaria plumosa.

80. Neomammillaria rhodantha (Link and Otto).

Mammillaria rhodantha Link and Otto, Icon, Pl. Rar. 51. 1829.
Mammillaria pulchra Haworth in Edwards's Bot. Reg. *16:* pl. 1329. 1830.
Mammillaria fulvispina Haworth, Phil. Mag. *7:* 108. 1830.
?*Mammillaria inuncta* Hoffmannsegg, Preiss-Verz. ed. 7. 23. 1833.
Mammillaria erinacea Wendland, Cact. Herrenh. 1835.
Mammillaria chrysacantha Otto in Pfeiffer, Enum. Cact. 28. 1837.
Mammillaria fuscata Pfeiffer, Enum. Cact. 28. 1837.
Mammillaria tentaculata Otto in Pfeiffer, Enum. Cact. 29. 1837.
Mammillaria rhodantha rubens Pfeiffer, Enum. Cact. 31. 1837.
Mammillaria rhodantha andreae * Otto in Pfeiffer, Enum. Cact. 31. 1837.
Mammillaria rhodantha prolifera Pfeiffer, Enum. Cact. 31. 1837.
Mammillaria rhodantha neglecta Pfeiffer, Enum. Cact. 31. 1837.
Mammillaria rhodantha wendlandii Pfeiffer, Enum. Cact. 31. 1837.
Mammillaria ruficeps Lemaire, Cact. Gen. Nov. Sp. 37. 1839.
Mammillaria odieriana Lemaire, Cact. Gen. Nov. Sp. 46. 1839.
Mammillaria pyrrhochracantha Lemaire, Cact. Gen. Nov. Sp. 51. 1839.
Mammillaria rhodantha major Monville in Lemaire, Cact. Gen. Nov. Sp. 98. 1839.
Mammillaria pfeifferi Booth in Scheidweiler, Bull. Acad. Sci. Brux. *6:* 93. 1839.
Mammillaria pfeifferi altissima Scheidweiler, Bull, Acad. Sci. Brux. *6:* 93. 1839.
Mammillaria pfeifferi dichotoma Scheidweiler, Bull. Acad. Sci. Brux. *6:* 93. 1839.
Mammillaria pfeifferi flaviceps Scheidweiler, Bull. Acad. Sci. Brux. *6:* 93. 1839.
Mammillaria pfeifferi fulvispina Scheidweiler, Bull. Acad. Sci. Brux. *6:* 93. 1839.
Mammillaria pfeifferi variabilis Scheidweiler, Bull. Acad. Sci. Brux. *6:* 93. 1839.
?*Mammillaria crassispina* Pfeiffer, Allg. Gartenz. *8:* 406. 1840.
?*Mammillaria stenocephala* Scheidweiler, Allg. Gartenz. *9:* 43. 1841.
?*Mammillaria imbricata* Wegener, Allg. Gartenz. *12:* 66. 1844.
Mammillaria crassispina gracilior Salm-Dyck, Cact. Hort. Dyck. 1844. 8. 1845.
Mammillaria rhodantha centrispina Link in Förster, Handb. Cact. 198. 1846.
Mammillaria sulphurea Sencke in Förster, Handb. Cact. 200. 1846.
Mammillaria robusta Otto in Förster, Handb. Cact. 207. 1846.
Mammillaria tentaculata ruficeps Förster, Handb. Cact. 207. 1846.
Mammillaria stueberi Otto in Förster, Handb. Cact. 517. 1846.
Mammillaria fulvispina rubescens Salm-Dyck, Cact. Hort. Dyck. 1849. 10. 1850.

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* *Mammillaria andreae* was used by Schumann (Gesamtb. Kakteen 598. 1898).

Mammillaria rhodantha sulphurea Salm-Dyck, Cact. Hort. Dyck. 1849. 11. 1850.
Mammillaria rhodantha ruficeps Salm-Dyck, Cact. Hort. Dyck. 1849. 11. 1850.
Mammillaria chrysacantha fuscata Salm-Dyck, Cact. Hort. Dyck. 1849. 12. 1850.
Mammillaria rhodantha rubescens Salm-Dyck, Cact. Hort. Dyck. 1849. 97. 1850.
Mammillaria odieriana rigidior Salm-Dyck, Cact. Hort. Dyck. 1849. 98. 1850.
Mammillaria lanifera Salm-Dyck, Cact. Hort. Dyck. 1849. 98. 1850. Not Haworth, 1824.
?*Mammillaria russea* Dietrich, Allg. Gartenz. *19:* 347. 1851.
Mammillaria odieriana rubra Sencke in Förster, Handb. Cact. ed. 2. 295. 1885.
Mammillaria odieriana cristata Hortus in Förster, Handb. Cact. ed. 2. 295. 1885.
Mammillaria tentaculata picta Förster, Handb. Cact. ed. 2. 309. 1885.
Mammillaria crassispina rufa Rümpler in Förster, Handb. Cact. ed. 2. 311. 1885.
Cactus chrysacanthus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus crassispinus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus fuscatus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus odieranus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus pyrrhochroacanthus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus rhodanthus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus ruficeps Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus stenocephalus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus stueberi Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus tentaculatus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus capillaris Coulter, Contr. U. S. Nat. Herb. *3:* 107. 1894.
Cactus rhodanthus sulphureospinus Coulter, Contr. U. S. Nat. Herb. *3:* 107. 1894.
Mammillaria rhodantha pfeifferi Schumann, Gesamtb. Kakteen 550. 1898.
Mammillaria rhodantha rubra Schumann, Gesamtb. Kakteen 550. 1898.
Mammillaria rhodantha ruberrima Schumann, Gesamtb. Kakteen 550. 1898.
Mammillaria rhodantha pyramidalis Schumann, Gesamtb. Kakteen 550. 1898.
Mammillaria rhodantha callaena Schumann, Gesamtb. Kakteen 550. 1898.
Mammillaria rhodantha crassispina Schumann, Gesamtb. Kakteen 550. 1898.
Mammillaria rhodantha droegeana Schumann, Gesamtb. Kakteen 550. 1898.
Mammillaria rhodantha chrysacantha Schumann, Gesamtb. Kakteen 550. 1898.
Mammillaria rhodantha stenocephala Schumann, Gesamtb. Kakteen 550. 1898.
Mammillaria rhodantha fuscata Schumann, Gesamtb. Kakteen 551. 1898.
Mammillaria rhodantha odieriana Schelle, Handb. Kakteenk. 257. 1907.
Mammillaria rhodantha fulvispina Schelle, Handb. Kakteenk. 257. 1907.
Mammillaria rhodantha tentaculata Hortus in Schelle, Handb. Kakteenk. 257. 1907.

Cylindric, 1 to 3 dm. long, erect, dull green; tubercles terete, somewhat narrowed toward the apex, 3 to 5 mm. long, not yielding milk when pricked; axils of tubercles sometimes bearing bristles, often naked; radial spines 15 to 20, white, 5 to 7 mm. long; central spines 4 to 6, reddish brown, straight, ascending, much stouter than the radials, 10 to 12 mm. long; flowers numerous, rose-colored, 12 mm. broad; inner perianth-segments linear, somewhat spreading, pointed; filaments red; stigma-lobes 4 or 5, rose-colored; fruit 2.5 cm. long, cylindric, lilac to red; seeds brownish.

Type locality: Mexico.

Distribution: Probably central Mexico.

We have had this plant in cultivation but it has never flowered with us; however, it is very distinct from anything else we know.

Mammillaria flaviceps is referred by Labouret to *M. crassispina,* now usually referred to *M. rhodantha.*

Mammillaria floccigera (and its variety *longispina*) Förster (Handb. Cact. 254. 1846), as well as *M. aurata* and *M. hybrida* (Pfeiffer, Enum. Cact. 31. 1837), are given by Schumann as synonyms of *M. rhodantha,* but none of them was described at the places cited.

Mammillaria erinacea Wendlend is unknown to us; it is referred to *Mammillaria rhodantha* by the Index Kewensis, but whether it was described or not we do not know.

Mammillaria fulvispina was said by Haworth to come from Brazil, while the Index Kewensis refers it to Brazil and Mexico. If of this relationship, it is from Mexico. *Mammillaria radula* Scheidweiler (Förster, Handb. Cact. 208. 1846), referred by Schumann as a synonym of this species, was given by Förster as a synonym of *Mammillaria phaeacantha.*

Mammillaria pyramidalis Link and Otto (Verh. Ver. Beförd. Gartenb. **6:** 429. 1830), given as a synonym of this species by Schumann, is only a name.

Mammillaria atrata Mackie (Curtis's Bot. Mag. **65:** pl. 3642. 1839) is also referred here by Schumann. The plant is supposed to have come from Chile and is probably referable to *Neoporteria,* which see (Cactaceae **3:** 97. 1922).

Mammillaria pyrrhocentra Otto, its var. *gracilior* (Salm-Dyck, Cact. Hort. Dyck. 1844. 8. 1845), and *M. fulvispina pyrrhocentra* Salm-Dyck (Cact. Hort. Dyck. 1849. 10. 1850) were referred as synonyms of *M. rhodantha* by Schumann, but were not described at the places cited.

Mammillaria aurea Pfeiffer (Förster, Handb. Cact. 200. 1846; *M. rhodantha aurea* Salm-Dyck, Cact. Hort. Dyck. 1849. 11. 1850) is referred here. We have found no description of it. *M. odieriana aurea* Salm-Dyck (Cact. Hort. Dyck. 1844. 7. 1845). also undescribed, may be the same.

Mammillaria rhodantha cristata (Förster, Handb. Cact. ed. 2. 292. 1885) is only an abnormal form.

Mammillaria recurvispina Hildmann (Schelle, Handb. Kakteenk. 257. 1907) is given without synonymy or description. *M. rhodantha schochiana* (*M. schochiana* Hortus) is also given at the same place, but so far as we can learn has not been published.

Mammillaria tentaculata conothele Monville is given by Labouret (Monogr. Cact. 55. 1853) as a synonym of *M. stueberi,* while he refers *M. tentaculata fulvispina* (Monogr. Cact. 44. 1853) to *M. fulvispina.*

Mammillaria tentaculata rubra (Förster, Handb. Cact. 207. 1846) was given as a synonym of *M. tentaculata ruficeps.*

Mammillaria olivacea was cited by Pfeiffer (Enum. Cact. 180. 1837) as a synonym of *M. tentaculata.*

Mammillaria neglecta was given as a synonym of *M. rhodantha neglecta* by Salm-Dyck (Cact. Hort. Dyck. 1849. 11. 1850).

Mammillaria rhodantha var. *inuncta* Hoffmannsegg was listed by Labouret (Monogr. Cact. 45. 1853) as one of the synonyms of *M. rhodantha. M. rhodantha rubra* was given by Rümpler (Förster, Handb. Cact. ed. 2. 292. 1885) as a synonym of *M. rhodantha ruficeps,* but afterwards was formally published by Schumann.

Mammillaria rhodantha celsii Lemaire (Labouret, Monogr. Cact. 48. 1853) was given as a synonym of *M. lanifera.* It probably belongs to *M. rhodantha. Cactus capillaris* was made by Coulter because of the older *Mammillaria lanifera* of Haworth. Palmer's plant from Saltillo (1880), preserved in the Missouri Botanical Garden, is very different and suggests that the labels have been mixed.

Illustrations: Knippel, Kakteen pl. 24; De Laet, Cat. Gén. f. 50, No. 9; Wiener Illustr. Gart. Zeit. **29**: f. 22, No. 9; Haage and Schmidt, Haupt-Verz. Cact. **1912**: 37; Link and Otto, Icon. Pl. Rar. pl. 26; Gard. Chron. III. **42**: 290. f. 116; Schelle, Handb. Kakteenk. 256. f. 179; Gartenwelt **12**: 200; Abh. Bayer. Akad. Wiss. München **2**: pl. 1, 1. f. 3; Möllers Deutsche Gärt. Zeit. **25**: 475. f. 8, No. 22, as *Mammillaria rhodantha;* Grässner, Haupt-Verz. Kakteen **1912**: 24; Schelle, Handb. Kakteenk. 258. f. 181, as *Mammillaria rhodantha pfeifferi*; Grässner, Haupt-Verz. Kakteen **1912**: 24, as *M. rhodantha fuscata:* Schelle, Handb. Kakteenk, 258. f. 180, as *M. rhodantha fulvispina;* Blanc, Cacti 73. No. 1434; Cact. Journ. **1**: 43, as *M. odieriana:* Cact. Journ. **1**: 43; pl. for February, as *M. pfeifferi;* Edwards's Bot. Reg. **16**: pl. 1329, as *M. pulchra;* Nov. Act. Nat. Cur. **19**: pl. 16, f. 8, as *Mammillaria tentaculata.*

Figure 129 is from a photograph of a plant obtained by Dr. Rose through W. Mundt in 1913, which is now growing at Washington.

81. Neomammillaria plumosa (Weber).

Mammillaria plumosa Weber, Dict. Hort. Bois 804. 1898.

Small, growing in dense clusters sometimes 15 cm. broad, entirely covered by the mass of white spines; tubercles small, somewhat woolly in their axils, 2 to 3 mm. long; spines about 40, all radial, weak, plumose, 3 to 7 mm. long; flowers white, small, 3 to 4 mm. long; perianth-segments with a red line running down the center; seeds black.

Type locality: Northern Mexico.

Distribution: Northern Mexico.

This plant for a long time passed in the trade under the name of *Mammillaria lasiacantha,* but it is, of course, very different. It is a very striking species and differs from all the others in its feather-like spines. We have had it under observation since 1907 and it has only once flowered (1921).

According to Walton, it is called the feather ball on account of the feather-like spines.

Illustrations: Möllers Deutsche Gärt. Zeit. **25:** 475. f. 8, No. 16; Schelle, Handb. Kakteenk. 252. f. 173; Ann. Rep. Smiths. Inst. **1908:** pl. 3, f. 6; Haage, Cact. Kultur ed. 2. 189; Journ. Hort. Home Farm. III. **60:** 7, as *Mammillaria plumosa:* Cact. Journ. **1:** pl. for February, in part; Darel, Illustr. Handb. Kakteenk. 94. f. 76; Blanc, Hints on Cacti 70. f. 1355; Blanc. Illustr. Price List Cacti 13, as *M. lasiacantha.*

Figure 131 is from a photograph, furnished by Dr. Safford, showing the spines.

82. Neomammillaria prolifera (Miller).

Cactus proliferus * Miller, Gard. Dict. ed. 8. No. 6. 1768.
Cactus glomeratus Lamarck, Encycl. *1:* 537. 1783.
Cactus mammillaris prolifer Aiton, Hort. Kew. *2:* 150. 1789.
Mammillaria prolifera Haworth, Syn. Pl. Succ. 177. 1812.
Cactus pusillus De Candolle, Cact. Hort. Monsp. 184. 1813. Not Haworth, 1803.
Cactus stellatus Willdenow, Enum. Pl. Suppl. 30. 1813.
Mammillaria stellaris Haworth, Suppl. Pl. Succ. 72. 1819.
Mammillaria pusilla Sweet, Hort. Brit. 171. 1826.
Mammillaria stellata Sweet, Hort. Brit. 171. 1826.
Mammillaria glomerata De Candolle, Prodr. *3:* 459. 1828.
Mammillaria pusilla major Pfeiffer, Enum. Cact. 36. 1837.
Cactus haworthianus Kuntze, Rev. Gen. Pl. *1:* 259. 1891.
Mammillaria pusilla haitiensis Schumann, Blühende Kakteen *1:* under pl. 46. 1904.

Low, growing in colonies often 6 dm. in diameter, the individual plants globose or cylindric, 3 to 6 cm. in diameter, of soft texture; tubercles conic, about 8 mm. long, spreading; axils of tubercles with long, hair-like bristles; radial spines many, hair-like; central spines 5 to 12, much stouter than the radials, with bright yellow tips, puberulent; flowers borne in old axils but toward top of plant, small, yellowish white; inner perianth-segments erect, pale yellow, with brownish mid-rib, acute; filaments pale rose-colored; anthers at first deflexed inward; style shorter than filaments; stigma-lobes 3, yellow; fruit crowned by persistent withering perianth, clavate, somewhat curved, 1.5 to 2 cm. long, scarlet; seeds black, pitted, a little depressed; aril white, triangular.

Type locality: West Indies.

Distribution: Cuba and Hispaniola. Loddiges reports it from South America, doubtless in error.

At the United States Naval Station, Guantánamo Bay, Cuba, the plant grows in low, dry thickets and is quite inconspicuous but abundant.

Dr. Shafer referred to this species (Bull. N. Y. Bot. Gard. **13:** 139) as *Mammariella,* without description or citation.

Burmann's plate (201, f. 1) of this plant shows most of the tubercles without spines or hairs but these have doubtless been omitted by the artist, for Plumier says (Cat. p. 19): "*Melocactus* minimus, languinosus et tuberosus."

Haworth (Phil. Mag. 7: 114. 1830) would exclude *Mammillaria pusilla* (Mém. Mus. Hist. Nat. Paris 17: pl. 2, f. 1) as figured by De Candolle. His illustration is evidently faulty, but his description seems to answer our plant.

The name *Mammillaria pusilla minor* occurred in the Index of the Cacti in the Botanical Garden of Berlin for 1829 (Verh. Ver. Beförd. **6:** 429. 1830), but it is without description. It is mentioned again by Salm-Dyck (Hort. Dyck. 156. 1834), who credits the name to Otto, but he does not describe it.

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* Otto Kuntze (Rev. Gen. Pl. *1:* 259. 1891) publishes this binomial as *Cactus prolifer.* Pfeiffer (Enum. Cact. 9. 1837) uses this later binomial for another species, crediting it to Willdenow, but we do not find it used elsewhere.

Mammillaria granulata Meinshausen (Wöchenschr. Gärtn. Pflanz. **1:** 264. 1858; *Cactus granulatus* Kuntze, Rev. Gen. Pl. **1:** 260. 1891) was described without the flowers and fruit being known and it has never been identified. Meinshausen says that it has the habit of *M. pusilla,* but he considered it different otherwise.

Cactus stellaris was given by Haworth (Suppl. Pl. Succ. 72. 1819) instead of *C. stellatus* Willdenow.

Mammillaria pusilla cristata (Schelle, Handb. Kakteenk. 249. 1907) is probably only a form.

Illustrations: Loudon, Encycl. Pl. 410. f. 6842, as *Cactus stellaris;* Loddiges, Bot. Cab. **1:** pl. 79, as *Cactus stellatus;* Plukenet, Opera Bot. **1:** pl. 29, f. 2, as *Ficoides* etc.; Dict. Hort. Nicholson Suppl. 514. f. 547; Abh. Bayer. Akad. Wiss. München **2:** pl. 1, VIII, f. 7; Rümpler, Sukkulenten 197. f. 110; Monatsschr. Kakteenk. **8:** 73; Mém. Mus. Hist. Nat. Paris **17:** pl. 2, f. 1; Ann. Rep. Smiths. Inst. **1908:** pl. 2, f. 4; Blanc, Cacti 74, No. 1500; Schumann, Gesamtb. Kakteen f. 87; Blühende Kakteen **1**:pl. 46; Ann. Inst. Roy. Hort. Fromont **2:** pl. 1, f. B; Watson, Cact. Cult. ed. 2. 255. f. 96; ed. 3. f. 45; Remark, Kakteenfreund 15; Cact. Journ. **2:** 6, as *Mammillaria pusilla.*

Figure 132 is from a photograph by Ernest Braunton of a clump of plants growing in the Huntington collection near Los Angeles, California.

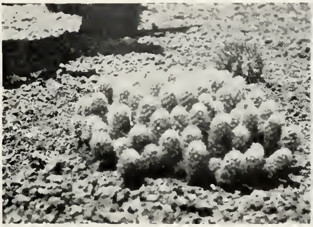


FIG. 132.—Neomammillaria prolifera.

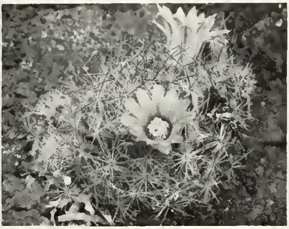


FIG. 133.—Neomammillaria multiceps.

83. Neomammillaria multiceps (Salm-Dyck).

Mammillaria multiceps Salm-Dyck, Cact. Hort. Dyck. 1849. 81. 1850.
Mammillaria multiceps elongata Meinshausen, Wöchenschr. Gärtn. Pflanz. *1:* 27. 1858.
Mammillaria multiceps grisea Meinshausen, Wöchenschr. Gärtn. Pflanz. *1:* 27. 1858.
Mammillaria multiceps humilis Meinhausen, Wöchenschr. Gärtn. Pflanz. *1:* 27. 1858.
Mammillaria multiceps perpusilla Meinshausen, Wöchenschr. Gärtn. Pflanz. *1:* 27. 1858.
Mammillaria pusilla texana Engelmann, Cact. Mex. Bound. 5. 1859.
Mammillaria texana Poselger in Young, Fl. Texas. 279. 1873.
Cactus multiceps Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus stellatus texanus Coulter, Contr. U. S. Nat. Herb. *3:* 108. 1894.
Cactus texanus Small, Fl. Southeast. U. S. 812. 1903.

Cespitose, often forming large clumps; separate plants globose to short-oblong, often only 1 to 2 cm. in diameter; tubercles small, terete, hairy in their axils; radial spines hair-like, white; central spines several, pubescent, yellowish at base, dark brown above; flowers about 12 mm. long, whitish to yellowish salmon, often becoming reddish on outside; fruit oblong, 8 to 12 mm. long, scarlet; seed black, 1 mm. long, punctate.

Type locality: Not cited.

Distribution: Texas and northeastern Mexico.

It is sometimes classified as a variety of *Mammillaria prolifera,* from which it differs in having the central spines always brown-tipped instead of golden yellow; it is somewhat smaller, with slightly smaller seeds.

Mr. Robert Runyon says that this plant forms clumps usually about 10 cm. broad, but sometimes broader. It is never very plentiful but has a rather wide distribution, and seems to prefer mesquite thickets where the soil is very rich, but occasionally is found on rocky hillsides.

Mammillaria pusilla mexicana, offered for sale by Grässner (Monatsschr. Kakteenk. February 1920), probably belongs here.

Mammillaria caespititia Hortus was referred by Salm-Dyck as a synonym of *M. multiceps*. *M. pusilla caespititia* (Schelle, Handb. Kakteenk. 249. 1907) is the same.

Mammillaria parvissima Karwinsky (Wöchenschr. Gärtn. Pflanz. **1**: 27. 1858) is sometimes credited to Meinshausen, but seems never to have been described. *M. perpusilla* Meinshausen, given only as a synonym, belongs here and the name occurs on the page mentioned above.

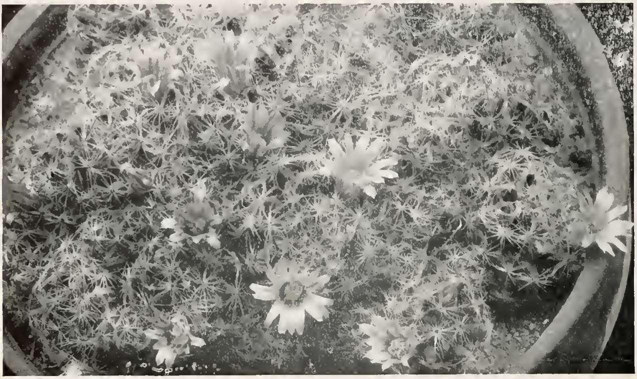


Fig. 134.—Neomammillaria multiceps.

Illustrations: Cact. Mex. Bound. pl. 5; Cact. Journ. **2**: 93; Förster, Handb. Cact. ed. 2. 262. f. 25; Schelle, Handb. Kakteenk. 249. f. 168, as *Mammillaria pusilla texana*.

Plate XIV, figure 5, shows a very small plant in flower, collected by Robert Runyon near Brownsville, Texas, in 1921; figure 6 shows a plant received from the Missouri Botanical Garden in 1904 which flowered in the New York Botanical Garden in March 1912. Figure 134 is from a photograph of a plant collected near Victoria, Mexico, by Dr. Edward Palmer, which was grown for many years in Washington; figure 133 shows a small plant photographed by Robert Runyon on July 10, 1921.

84. Neomammillaria camptotricha (Dams).

Mammillaria camptotricha Dams, Gartenwelt *10:* 14. 1905.

Plants globose, cespitose, deep green, 5 cm. in diameter; tubercles somewhat elongated, often curved, 2 cm. long, terete, not at all milky, bearing bristles in the axils; spines 2 to 4, described as up to as many as 8, yellowish, bristle-like, spreading and twisted or bent, often 3 cm. long; spine-areoles small, circular, a little woolly at first; axils of tubercles bristly; flowers small, about 1 cm. long; outer perianth-segments greenish; inner perianth-segments white, 10 mm. long, acute.

Type locality: Mexico.

Distribution: Deserts of eastern Querétaro, Mexico.

This plant was collected by Rose and Painter between Higuerillas and San Pablo, August 23, 1905 (No. 11536), and flowered in Washington on October 3, 1905. In 1913 L. Quehl of Halle sent us some flowers of this species.

Illustrations: Blühende Kakteen **3:** pl. 151; Möllers Deutsche Gärt. Zeit. **25:** 475. f. 8, No. 6, as *Mammillaria camptotricha.*

Figure 135 is from a photograph of the plant collected by Dr. Rose in 1905.

85. Neomammillaria eriacantha (Link and Otto).

Mammillaria eriacantha Link and Otto in Pfeiffer, Enum. Cact. 32. 1837.
Cactus eriacanthus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

Solitary or cespitose, 10 to 15 cm. high, cylindric, 5 cm. in diameter; tubercles spiraled, in 22 rows; radial spines about 20, delicate, spreading, pubescent; central spines 2, widely spreading, stouter than the radials, also pubescent, yellowish; flowers borne in a ring above the middle of the plant, yellow, 14 mm. broad; inner perianth-segments about 14, linear, acute; stigma-lobes 4; fruit at first greenish white, afterwards tinged with red, short-clavate.

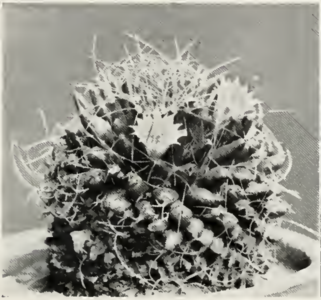


FIG. 135.—Neomammillaria camptotricha.

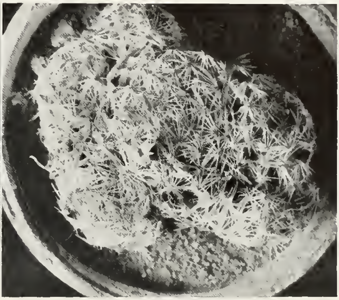


FIG. 136.—Neomammillaria schiedeana.

Type locality: Mexico.

Distribution: Central Mexico.

A plant, collected by McDowell, was seen in the collection of the Instituto Medico Nacional in the City of Mexico, but no specimen was obtained.

Mammillaria columbiana Salm-Dyck (Cact. Hort. Dyck. 1849. 99. 1850) is probably to be referred here. It is doubtless of Mexican rather than of Colombian origin.

Mammillaria eriantha (Pfeiffer, Enum. Cact. 32. 1837), referred here by Pfeiffer, was never described.

Mammillaria cylindracea De Candolle (Mém. Mus. Hist. Nat. Paris **17:** 111. 1828) is referred here by Schumann and also by Pfeiffer and Otto, but the description of it would suggest a different species. Kuntze changes the name to *Cactus cylindraceus* (Rev. Gen. Pl. **1:** 260. 1891). Here is also referred *Mammillaria cylindrica flavispina* (Labouret, Monogr. Cact. 88. 1853).

Illustrations: Pfeiffer and Otto, Abbild, Beschr. Cact. **1:** pl. 25; Schelle, Handb. Kakteenk. 256. f. 178, as *Mammillaria eriacantha.*

Figure 138 is a reproduction of the first illustration above cited.

86. Neomammillaria schiedeana (Ehrenberg).

Mammillaria schiedeana Ehrenberg in Schlechtendal, Allg. Gartenz. *6:* 249. 1838.
?*Mammillaria sericata* Lemaire, Cact. Gen. Nov. Sp. 44. 1839.
Cactus schiedianus Kuntze, Rev. Gen. Pl. *1:* 261.1891.
Mammillaria dumetorum J. A. Purpus, Monatsschr. Kakteenk. *22:* 149. 1912.
?*Mammillaria cephalophora* Quehl, Monatsschr. Kakteenk. *24:* 158. 1914. Not Salm-Dyck, 1850.

Densely cespitose, somewhat soft in texture; axils of tubercles bearing long bristle-like white hairs; tubercles green, terete; radial spines about 30, white, spreading, bristle-like, puberulent; central spines 6 to 10, spreading and appressed against the radials, a little stouter, often tinged with yellow; flowers 15 mm. long; inner perianth-segments white; filaments white; style cream-colored; stigma-lobes 4, short, obtuse.

Type locality: Near Puente de Dios, Mexico.

Distribution: Central Mexico.

The Index Kewensis refers *Mammillaria sericata* Lemaire to *M. magnimamma.*

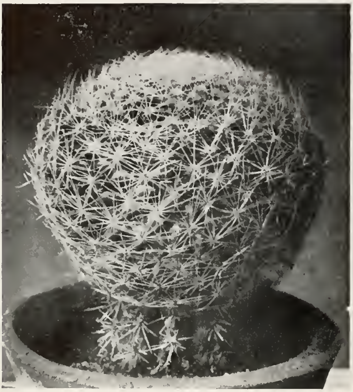


Fig. 137.—Neomammillaria lenta.

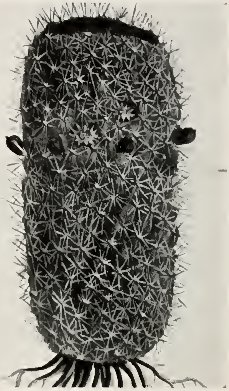


Fig. 138.—Neomammillaria eriacantha.

Illustrations: Schumann, Gesamtb. Kakteen f. 113; Blühende Kakteen **1:** pl. 13; Monatsschr. Kakteenk. **8:** 12; **13:** 92, f. A, as *Mammillaria schiedeana;* Monatsschr. Kakteenk. **23:** 89, as *Mammillaria dumetorum;* (?) Monatsschr. Kakteenk. **24:** 158, as *Mammillaria cephalophora.*

Figure 136 is from a photograph of a plant collected by Dr. C. A. Purpus at San Rafael, Mexico, in 1910.

87. Neomammillaria lasiacantha (Engelmann).

Mammillaria lasiancantha Engelmann, Proc. Amer. Acad. *3:* 261. 1856.
Mammillaria lasiacantha minor Engelmann, Cact. Mex. Bound. 5. 1859.
Cactus lasiacanthus Kuntze, Rev. Gen. Pl. *1:* 259. 1891.

Globose, 2 to 2.5 cm. in diameter; tubercles small, their axils naked; spines 40 to 60, in more than one series, white, puberulent, 2 to 4 mm. long; flowers 12 mm. long, whitish or pink; fruit 1 to 2 cm. long; seeds blackish, pitted.

Type locality: On the Pecos in western Texas.

Distribution: Western Texas and northern Chihuahua. Reported also from Arizona, but doubtless incorrectly.

We have seen no specimens of *N. lasiacantha*, except the type, but the following species, first described as a variety of *lasiacantha*, is very common in eastern Texas and northern Mexico. Possibly the two should be united, the typical form simply representing a juvenile phase.

Illustrations: Cact. Mex. Bound. pl. 3; Schumann, Gesamtb. Kakteen 522. f. 86; Engler and Prantl, Pflanzenfam. 3^{6a}: f. 56, A; Blanc, Cacti 70. No. 1335; West Amer. Sci. **13:** 39, as *Mammillaria lasiacantha*.

88. Neomammillaria denudata (Engelmann).

Mammillaria lasiacantha denudata Engelmann, Cact. Mex. Bound. 5. 1859.
Cactus lasiacanthus denudatus Coulter, Contr. U. S. Nat. Herb. *3:* 100. 1894.
Mammillaria lasiandra denudata Quehl, Monatsschr. Kakteenk. *19:* 79. 1909.

Globose, 2.5 to 3.5 cm. in diameter; tubercles 5 to 6 mm. long; spines 50 to 80, glabrous or nearly so, 3 to 5 mm. long, the innermost usually much shorter; flowers and fruit from near the center but not from the axils of young tubercles; flowers 10 to 12 mm. long; perianth-segments few, about 12, oblong, obtuse, the margins white, the center light purple; stamens white; style and stigma-lobes green; fruit clavate, red, 1.5 to 2 cm. long; seeds black with basal hilum.

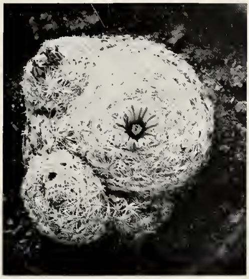


Fig. 139.—Neomammillaria denudata

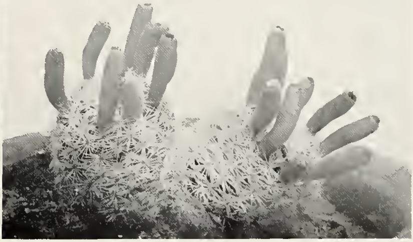


Fig. 140.—Neomammillaria lenta.

Type locality: Western Texas.

Distribution: Western Texas and northern Coahuila, Mexico.

The flowers open about mid-day and close at night; in one case which we recorded the flowers opened for six consecutive days.

Mammillaria rungii (Schumann, Gesamtb. Kakteen 522. 1898), an unpublished garden name, was supposed by Schumann to be referable to *M. lasiacantha denudata.*

Illustrations: Cact. Mex. Bound. pl. 4; Möllers Deutsche Gärt. Zeit. **25:** 475. f. 8, No. 21, as *Mammillaria lasiacantha denudata.*

Figure 139 is from a photograph of a plant collected by Elmer Stearns in 1909, which afterwards flowered in Washington.

89. Neomammillaria lenta (K. Brandegee).

Mammillaria lenta K. Brandegee, Zoe *5:* 194. 1904.

Described as cespitose; individuals globose to short-cylindric, almost hidden by the white delicate spines; tubercles very slender, light green; spine-areoles naked; spines about 40, very fragile; axils woolly and occasionally bearing a single bristle; flowers whitish, 7 mm. long; perianth-segments pointed; fruit red, clavate; seeds 1 mm. in diameter, dull black.

Type locality: Near Viesca, in Coahuila, Mexico.

Distribution: Coahuila, Mexico.

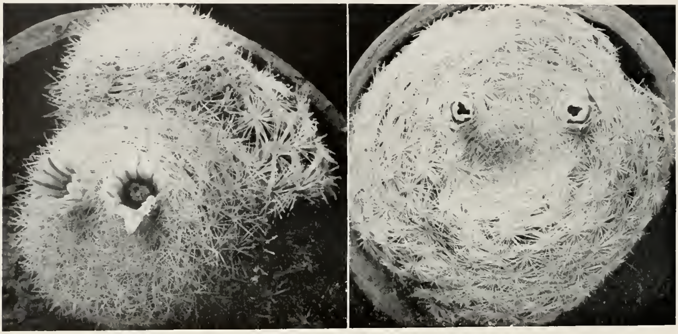
Illustration: Monatsschr. Kakteenk. **16:** 40, as *Mammillaria lenta.*

Figure 137 is from a photograph obtained from L. Quehl in 1921; figure 140 is from a photograph of a fruiting plant sent from Parras, Mexico, by C. A. Purpus in 1905.

90. **Neomammillaria candida** (Scheidweiler).

Mammillaria candida Scheidweiler, Bull. Acad. Sci. Brux. *5:* 496. 1838.
Mammillaria sphaerotricha Lemaire, Cact. Gen. Nov. Sp. 33. 1839.
Mammillaria humboldtii Ehrenberg, Linnaea *14:* 378. 1840.
Mammillaria sphaerotricha rosea Salm-Dyck, Cact. Hort. Dyck. 1849. 85. 1850.
Cactus humboldtii Kuntze, Rev. Gen. Pl. *1:* 260. 1891. Not Humboldt, Bompland, and Knuth, 1823.
Cactus sphaerotrichus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Mammillaria candida rosea Salm-Dyck in Schumann, Gesamtb. Kakteen 525. 1898.

Cespitose; individual plant globose, 5 to 7 cm. in diameter, almost hidden by the white spines; radial spines numerous, radiating; central spines 8 to 12, porrect, often brownish at tip, a little stouter than the radials; axils setose; flowers 2 cm. long, rose-colored; perianth-segments serrulate toward the apex; fruit red; seeds black.



FIGS. 141 and 142.—Neomammillaria candida.

Type locality: Near San Luis Potosí.

Distribution: Central Mexico.

Illustrations: Monatsschr. Kakteenk. **29:** 141, as *Mammillaria candida rosea;* Hort. Belge **5:** pl. 117; Möllers Deutsche Gärt. Zeit. **25:** 475. f. 8, No. 27; Blühende Kakteen **3:** pl. 169, as *Mammillaria candida.*

Figure 141 is from a photograph of a plant obtained by Dr. Palmer near San Luis Potosí in 1905; figure 142 is from a photograph of a plant collected by C. A. Purpus from near the same locality in 1910.

91. **Neomammillaria vetula** (Martius).

Mammillaria vetula Martius, Nov. Act. Nat. Cur. *16:* 338. 1832.
Cactus vetulus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Plant somewhat club-shaped, small, 4 to 5 cm. high; tubercles terete, light green, somewhat shining; axils of tubercles naked or sometimes with a small tuft of wool; radial spines about 25, spreading, white, bristle-like; central spines 1 to 6, stouter than the radials, brownish; flowers 12 to 15 mm. long, borne at upper part of plant; outer perianth-segments red with yellowish margins; inner perianth-segments cream-colored; filaments greenish; style green; stigma-lobes 5, white.

Type locality: San José del Oro, Hidalgo, Mexico.

Distribution: Hidalgo, Mexico.

The above description was drawn in part from a plant which flowered in Washington on November 8, 1912, and which had been sent to us by L. Buscationi from Catania, Italy. This plant gave off numerous young ones from the axils of the tubercles, but it has died.

Mammillaria vetula major Salm-Dyck (Walpers, Repert. Bot. 2: 270. 1843) is said to be the same as *M. grandiflora* Hortus. If so, this must be different from *M. grandiflora* Otto, which we have referred to *Neolloydia conoidea.*

Illustration: Nov. Act. Nat. Cur. **16**: pl. 24, as *Mammillaria vetula.*

Figure 143 is reproduced from the illustration above cited.

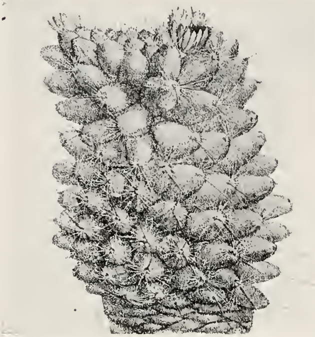


FIG. 143.—Neomammillaria vetula.

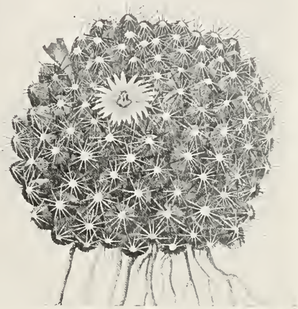


FIG. 144.—Neomammillaria discolor.

92. Neomammillaria fertilis (Hildmann).

Mammillaria fertilis Hildmann in Schumann, Gesamtb. Kakteen 503. 1898.

Cespitose, the individual plant globose to short-cylindric, dark green; tubercles arranged in 8 or 13 rows, a little woolly in their axils; radial spines 7 to 10, acicular, 6 mm. long; central spines 1 or 2, straight, stouter than the radials, 10 mm. long; flowers deep crimson, 2 cm. long; inner perianth-segments linear-lanceolate, acute.

Type locality: Mexico, but definite station not given.

Distribution: Mexico, but range unknown.

We have not seen living specimens of this plant but L. Quehl of Halle had it growing in 1913 and sent us flowers which we have used in this description.

93. Neomammillaria decipiens (Scheidweiler).

Mammillaria decipiens Scheidweiler, Bull. Acad. Sci. Brux. *5:* 496. 1838.
Mammillaria anancistra * Lemaire, Cact. Gen. Nov. Sp. 39. 1839.
Mammillaria guilleminiana Lemaire, Cact. Gen. Nov. Sp. 48. 1839.
Mammillaria glochidiata inuncinata Lemaire, Cact. Gen. Nov. Sp. 102. 1839.
Cactus decipiens Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus guilleminianus Kuntze. Rev. Gen. Pl. *1:* 261. 1891.
Cactus ancistrius Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Usually cespitose, deep green; tubercles soft, cylindric, about 1 cm. long, their axils bearing 2 or 3 bristles each; radial spines 7 to 9, spreading, slender, white, sometimes yellowish with brown tips, puberu-

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* Spelled *M. ancistria* by Walpers (Repert. Bot. *2:* 296. 1843).

lent when young; central spine 1, much longer than the radials, erect or ascending, 15 to 18 mm. long, dark brown; flower-buds pinkish, acute; flower 15 mm. long, broadly funnel-shaped; inner perianth-segments nearly white or faintly tinged with pink, acute; filaments white to pinkish; stigma-lobes 4, white or pinkish, slender, filiform.

Type locality: Not cited.

Distribution: San Luis Potosí.

The above description is drawn from plants growing in the top of *Calibanus caespitosus,* a curious, globose, lilliaceous plant of the desert of central Mexico, sent by Dr. E. Palmer from San Luis Potosí in 1905.

Schumann says that the axils of the tubercles are naked, while K. Brandegee describes them as bearing bristles as in our plant and so called for in the original description.

In some plants one or two of the upper radial spines are brown like the central spine; the flowers are delicately fragrant, remaining open during cloudy days. In cultivation this is one of the earliest species to flower; in 1918 it began to bloom early in January.

Mammillaria inuncinata (Lemaire, Cact. Gen. Nov. Sp. 39. 1839) was never described but belongs here.

Mammillaria ancistroides inuncinata Lemaire and *M. deficum* (Förster, Handb. Cact. 185. 1846), as synonyms, were referred here. *M. deficiens* Hortus (Salm-Dyck, Cact. Hort. Dyck. 1849. 7. 1850) is another name, used only as a synonym of this species.

Illustrations: Schumann, Gesamtb. Kakteen 528. f. 88; Knippel, Kakteen pl. 20; Schelle, Handb. Kakteenk. 249. f. 169; Blanc, Cacti 68. No. 1200, as *Mammillaria decipiens.*

Plate XIV, figure 3, is from a plant sent to the New York Botanical Garden by Weinberg in 1903, which flowered November 14, 1911.

94. Neomammillaria discolor (Haworth).

Mammillaria discolor Haworth, Syn. Pl. Succ. 177. 1812.
Cactus depressus De Candolle, Cact. Hort. Monsp. 84. 1813. Not Haworth, 1812.
Cactus pseudomammillaris Salm-Dyck, Liste Pl. Gr. *1:* 1. 1815.
Cactus spini Colla, Mem. Accad. Sci. Torino *33:* 133. 1826
Mammillaria pseudomammillaris Pfeiffer, Allg. Gartenz. *3:* 57. 1835.
Mammillaria discolor prolifera Pfeiffer, Enum. Cact. 28. 1837.
Mammillaria albida Haage in Pfeiffer, Enum. Cact. 28. 1837.
Mammillaria aciculata Otto in Pfeiffer, Enum. Cact. 29. 1837.
Mammillaria discolor monstrosa Monville in Lemaire, Cact. Gen. Nov. Sp. 99. 1839.
Mammillaria discolor albida Salm-Dyck, Cact. Hort. Dyck. 1844. 7. 1845.
?*Mammillaria curvispina* Otto in Dietrich, Allg. Gartenz. *14:* 204. 1846.
?*Mammillaria discolor pulchella* Otto in Förster, Handb. Cact. 206. 1846.
Mammillaria curvispina parviflora A. Dietrich, Allg. Gartenz. *14:* 204. 1846.
Mammillaria nitens Otto in Linke, Allg. Gartenz. *16:* 331. 1848.
Mammillaria pulchella Otto in Linke, Allg. Gartenz. *16:* 331. 1848.
Mammillaria discolor aciculata Salm-Dyck, Cact. Hort. Dyck. 1849. 11. 1850.
Mammillaria discolor curvispina Salm-Dyck, Cact. Hort. Dyck. 1849. 11. 1850.
Mammillaria discolor nitens Salm-Dyck, Cact. Hort. Dyck. 1849. 11. 1850.
Mammillaria polythele aciculata Salm-Dyck, Cact. Hort. Dyck. 1849. 15. 1850.
Mammillaria pulchella nigricans Monville in Labouret, Monogr. Cact. 40. 1853.
Cactus aciculatus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus discolor Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus pulchellus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Globose or somewhat depressed, often solitary, about 7 cm. in diameter; tubercles ovoid-conic, arranged in 13 to 15 spirals, their axils naked; radial spines 16 to 20, white, setaceous, widely spreading; central spines about 6, stouter than the radials, straight, at first black with white bases; flowers 15 mm. broad when fully open; inner perianth-segments linear, white, with a violet-rose stripe; fruit red, 2.5 cm. long.

Type locality: Not cited.

Distribution: Puebla, according to Schumann.

We have been unable to identify definitely this species. As there seems to be no type preserved we must rely upon the short original description and the early illustrations. The illustration of Loddiges (Bot. Cab. 17: pl. 1871) shows a plant with yellowish-brown spines and must belong elsewhere.

Mammillaria depressa was credited by mistake to De Candolle by Pfeiffer in listing the synonyms of *M. discolor* (Enum. Cact. 28. 1837).

Mammillaria confinis Haage, according to Pfeiffer (Enum. Cact. 28. 1837), appeared in "Haage, Catal. Cact. 1836" and he lists it as a synonym of *M. albida.*

Mammillaria canescens Hortus (Pfeiffer, Enum. Cact. 28. 1837) was given as a synonym of *M. discolor.* This is different from *M. canescens* Jacobi (Allg. Gartenz. **24**: 89. 1856) which Schumann lists among his unknown plants. (See also Lemaire, Cact. Gen. Nov. Sp. 99. 1839).

Mammillaria coniflora Hortus and *M. discolor coniflora* Salm-Dyck (Cact. Hort. Dyck. 1849. 11. 1850) are only names which belong here.

Mammillaria discolor fulvescens Salm-Dyck (Cact. Hort. Dyck. 1844. 7. 1845) was not formally published at the place here cited.

Mammillaria discolor breviflora (Förster, Handb. Cact. 206. 1846), although not described at the place here cited, is usually referred here.

Cactus pseudomammillaris appeared simply as a name in 1815 (Desfontaines, Tab. Bot. ed. 2. 191), and again in Pfeiffer's Enumeratio (28. 1837) as a synonym of *Mammillaria discolor prolifera.* Pfeiffer credits the name to Salm-Dyck and gives the reference to Allgemeine Gartenzeitung (**3**: 57. 1835), but the name appeared there under *Mammillaria* along with *spinii* and *canescens. M. spinii,* credited to Colla, is given by Salm-Dyck (Cact. Hort. Dyck. 1849. 11. 1850) as a synonym of *M. discolor.*

Schumann lists *Mammillaria rhodacantha* Salm-Dyck (Cact. Hort. Dyck. 1849. 96. 1850) among his unknown species. *M. rhodacantha pallidior* (Salm-Dyck, Cact. Hort. Dyck. 1844. 8. 1845) is only a name, while *M. discolor rhodacantha* (Walpers, Repert. Bot. **2**: 271. 1843) although never described, seems to be the same as *M. rhodacantha.*

Illustrations: Mém. Mus. Hist. Nat. Paris **17**: pl. 2, f. **2**: Ann. Inst. Roy. Hort. Fromont **2**: pl. 1, f. A; Loddiges, Bot. Cab. **17**: pl. 1671 (?), as *Mammillaria discolor;* Mem. Accad. Sci. Torino **33**: pl. 11, as *Cactus spini.*

Figure 144 is reproduced from the first illustration cited above.

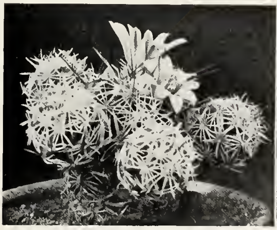

Fig. 145.—Neomammillaria fragilis.

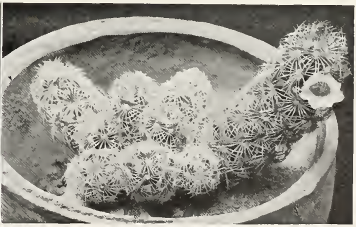

Fig. 146.—Neomammillaria elongata.

95. Neomammillaria fragilis (Salm-Dyck).

Mammillaria fragilis Salm-Dyck, Cact. Hort. Dyck. 1849. 103. 1850.

Stems usually oblong or club-shaped, sprouting freely towards the top; branches globose and breaking off at the slightest touch; tubercles bright green, terete, their axils nearly naked; radial spines 12 to 14, white, naked, spreading; central spines usually wanting, especially on branches, if present 1 or 2, elongated, erect, brownish especially at tip; young spine-areoles with white wool; flowers from upper part of plant but not from center, small, lasing for several days; cream-colored with outer segments somewhat pinkish; petals broad with a mucronate tip; filaments and style pale.

Type locality: Not cited.

Distribution: Doubtless Mexico, but not known from wild plants.

Mrs. K. Brandegee, some years ago (Zoe **5**: 9. 1900), called attention to the fact that this fragile little plant did not answer Pfeiffer's description of *Mammillaria gracilis* and that Salm-Dyck had suggested the very appropriate name of *M. fragilis,* which we have adopted here. The plant is known in the trade as *Mammillaria gracilis pulchella,* under which designation we received plants from Haage and Schmidt in 1921.

Illustrations: Schumann, Gesamtb. Kakteen 552. f. 90 (?); Blühende Kakteen **2**: pl. 68; Monatsschr. Kakteenk. **6**: 2; Möllers Deutsche Gárt. Zeit. **25**: 475. f. 8, No. 19; Gartenwelt **12**: 333, as *Mammillaria gracilis.*

Figure 145 is from a photograph sent us by L. Quehl.

96. Neomammillaria elongata (De Candolle).

Mammillaria elongata De Candolle, Mém. Mus. Hist. Nat. Paris *17:* 109. 1828.
Mammillaria subcrocea De Candolle, Mém. Mus. Hist. Nat. Paris *17:* 110. 1828.
Mammillaria intertexta De Candolle, Mém. Mus. Hist. Nat. Paris *17:* 110. 1828.
Mammillaria tenuis De Candolle, Mém. Mus. Hist. Nat. Paris *17:* 110. 1828.
Mammillaria tenuis media De Candolle, Mém. Mus. Hist. Nat. Paris *17:* 110. 1828.
?*Mammillaria densa* Link and Otto, Icon. Pl. Rar. 69. 1830.
Mammillaria echinata densa Pfeiffer, Enum. Cact. 6. 1837.
?*Mammillaria stella-aurata* Martius in Zuccarini, Abh. Bayer. Akad. Wiss. München *2:* 101. 1837.
?*Mammillaria minima* Reichenbach in Terscheck, Suppl. Cact. Verz. 1.
Echinocactus densus Steudel, Nom. ed. 2. *1:* 536. 1840.
Mammillaria tenuis minima Salm-Dyck in Walpers, Repert. Bot. *2:* 272. 1843.
Mammillaria subcrocea intertexta Salm-Dyck, Cact. Hort. Dyck. 1844. 13. 1845.
Mammillaria elongata intertexta Salm-Dyck, Cact. Hort. Dyck. 1849. 12. 1850.
Mammillaria elongata subcrocea Salm-Dyck, Cact. Hort. Dyck, 1849. 12. 1850.
Mammillaria subcrocea rufescens Salm-Dyck, Cact. Hort. Dyck. 1849. 100. 1850.
Mammillaria stella-aurata gracilispina Salm-Dyck, Cact. Hort. Dyck. 1849. 101. 1850.
?*Mammillaria anguinea* Otto in Salm-Dyck, Cact. Hort. Dyck. 1849. 101. 1850.
?*Mammillaria subechinata* Salm-Dyck, Cact. Hort. Dyck. 1849. 101. 1850.
?*Mammillaria rufocrocea* Salm-Dyck, Cact. Hort. Dyck. 1849. 102. 1850.
Cactus anguineus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus densus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus elongatus Kuntze, Rev. Gen. Pl. *1:* 260. 1891. Not Willdenow, 1813.
Cactus intertextus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus minimus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus stella-auratus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus subcroceus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus subechinatus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus tenuis Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Mammillaria elongata tenuis Schumann, Gesamtb. Kakteen 520. 1898.
Mammillaria elongata stella-aurata Schumann, Gesamtb. Kakteen 520. 1898.
Mammillaria elongata anguinea Schumann, Gesamtb. Kakteen 521. 1898.
Mammillaria elongata rufocrocea Schumann, Gesamtb. Kakteen 521. 1898.

Densely cespitose, forming small clumps, erect, ascending or prostrate, 3 to 10 cm. long, 1 to 1.5 cm. in diameter, almost covered by a mass of interlocking spines; tubercles arranged in a few rows, usually in spirals, short, their axils naked; spines usually all radial but sometimes with 1 porrect central spine, yellow or with brown tips, more or less recurved, 8 to 12 mm. long; spine-areoles pubescent when young; flowers at the upper part of the plant, white or nearly so, 6 to 7 mm. long; perianth-segments about 12, rather broad, obtuse or sometimes apiculate.

Type locality: Mexico.

Distribution: Eastern Mexico.

Mammillaria supertexta rufa is referred to *M. elongata intertexta* by Labouret (Monogr. Cact. 68. 1853).

Mammillaria caespitosa was first listed by De Candolle (Prodr. **3**: 460. 1828). It next appears in 1830 as a synonym in a list of the cacti of the Botanical Garden of Berlin. In 1837 Pfeiffer (Enum. Cact. 6) gives it as a synonym of *M. echinata densa.*

The three varieties *Mammillaria tenuis arrecta, M. tenuis coerulescens,* and *M. tenuis derubescens* were garden names in the Botanical Garden at Berlin, listed by Förster (Handb. Cact. 240. 1846).

Walpers (Repert. Bot. **2:** 272. 1843) records *M. intertexta rufocrocea,* but without any description.

Labouret (Monogr. Cact. 67. 1853) records the variety *M. stella-aurata minima* Salm-Dyck.

The two varieties of *Mammillaria subcrocea, anguinea,* and *rutila* (Walpers, Repert. Bot. **2:** 272. 1843) are without descriptions.

Mammillaria elongata rufescens Salm-Dyck (Cact. Hort. Dyck. 1844. 12. 1845) was not described at the place here cited, while the variety *straminea* was a garden name (Förster, Handb. Cact. 240. 1846).

Illustrations: Schumann, Gesamtb. Kakteen 519. f. 85; Blühende Kakteen **3:** pl. 174, as *Mammillaria elongata;* Schelle, Handb. Kakteenk. 247. f. 165, as *M. elongata minima;* Blanc, Cacti 72. No. 1398, as *M. minima;* Link and Otto, Icon. Pl. Rar. pl. 35, as *M. densa;* Abh. Bayer. Akad. Wiss, München **2:** pl. 1. VIII. f. 5, as *M. stella-aurata;* Curtis's Bot. Mag. **65:** pl. 3646; Edwards's Bot. Reg. **18:** pl. 1523; De Candolle, Mém. Cact. pl. 1; Loudon, Encycl. Pl. ed. 2 and 3. 1201. f. 17359, as *M. tenuis.*

Figure 146 is from a photograph of the common form in cultivation.

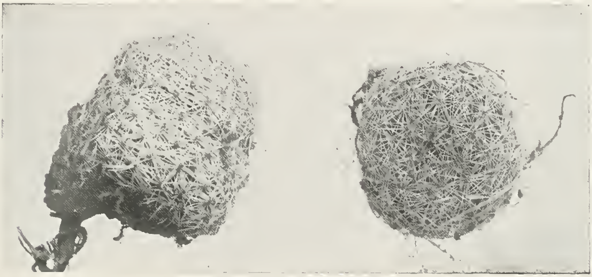

FIG. 147.—Neomammillaria oliviae.

97. Neomammillaria oliviae (Orcutt).

Mammillaria oliviae Orcutt, West Amer. Sci. *12:* 163. 1902.

Globose to short-cylindric, up to 10 cm. high, simple or becoming cespitose, sometimes as many as 8 together; tubercles ovoid, their axils naked; radial spines 25 to 36, snowy white or sometimes reddish brown, slender, rigid, 6 mm. long, the upper ones shorter; central spines 1 to 3, the lower one erect, rigid, white or tipped with chocolate brown; flowers about 3 cm. broad; perianth-segments lanceolate, acute, magenta, the upper part of the margins and tip with a narrow band of white; filaments deep magenta; style light pink; stigma-lobes olive-green; fruit scarlet, clavate, up to 2.5 cm. long; seeds small, black.

Type locality: West of Vail, a flag station on the Southern Pacific Railroad, near Tucson, Arizona.

Distribution: Mountains and deserts of Arizona.

Our description of the flowers is drawn from the notes and photograph of F. E. Lloyd's specimen sent us from Oro Blanco Mountains, Arizona. This is the only record we have had of this plant blooming, but fruiting plants were collected by C. R. Orcutt in 1922 (No. 802). It was first collected in considerable quantity by Mr. Orcutt, but his supply soon died out and most of the skeletons were sent to the U. S. National Herbarium, where they are now preserved.

In April 1921 Mr. Vernon Bailey rediscovered the species in Arizona and sent in a number of living specimens, but none has yet flowered. Mr. Orcutt reports that he has collected specimens which have hooked spines.

Mr. Orcutt dedicated this species to his wife, Mrs. Olivia Orcutt.

Figure 147 is from a photograph of two plants sent by Mr. Vernon Bailey from Continental, Arizona, in 1920.

98. Neomammillaria echinaria (De Candolle).

Mammillaria echinaria De Candolle, Mém. Mus. Hist. Nat. Paris *17:* 110. 1828.
Mammillaria echinata De Candolle, Mém. Cact. 3. 1834.
Mammillaria gracilis Pfeiffer, Allg. Gartenb. *6:* 275. 1838.
Cactus echinaria Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus gracilis Kuntze, Rev. Gen. Pl. *1:* 260. 1891. Not Miller, 1770.
Mammillaria elongata echinata Schumann, Gesamtb. Kakteen 521. 1898.

Plants cespitose, often forming large clumps, ascending or spreading, about 1 dm. long, 1 to 1.5 cm. in diameter; tubercles short, terete, their axils naked; spines pale yellow to glassy white; radial spines about 15, spreading; central spine one, straight, acicular, about 1 cm. long; flowers and fruit not known.

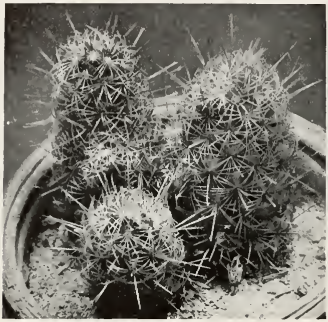

FIG. 148.—Neomammillaria echinaria.

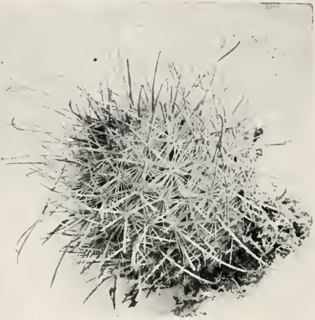

FIG. 149.—Neomammillaria rekoi.

Type locality: Mexico.

Distribution: Hidalgo, Mexico.

The above description is based on a plant collected by Dr. Rose in 1905 near Ixmiquilpan, and this we have had growing ever since.

The two varieties of *Mammillaria echinata, gracilior* Ehrenberg and *pallida,* published by Förster (Handb. Cact. 239. 1846), are probably only forms of the species.

The varieties of *Mammillaria gracilis* may or may not belong here. They are as follows: var. *laetevirens* Salm-Dyck (as a synonym of var. *pulchella*), var. *pulchella* Hoppfer and *virens,* all given by Förster in 1846 (Handb. Cact. 242). *Mammillaria elongata centrispina* (Förster, Handb. Cact. 240. 1846), which is only a name, may belong here.

Illustrations: Gartenflora **34:** pl. 1208, f. d, e, as *Mammillaria echinata.*

Figure 148 is from a photograph of the plant collected by Dr. Rose (No. 8990), mentioned above.

99. Neomammillaria pottsii (Scheer).

Mammillaria pottsii Scheer in Salm-Dyck, Cact. Hort. Dyck. 1849. 104. 1850.
Mammillaria leona Poselger, Allg. Gartenz. *21:* 94. 1853.
Echinocactus pottsianus Poselger, Allg. Gartenz. *21:* 107. 1853.
Cactus pottsii Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

More or less cespitose, the individual plants cylindric, 12 cm. long or more; tubercles almost hidden by the spines; radial spines about 30, white, weak, short; central spines 6 to 12, much stouter and longer, more or less ascending, grayish with brown tips; axils of tubercles woolly; flowers borne in a circle about 2 cm. below top of plant, about 1 cm. long; inner perianth-segments light purple, somewhat spreading at tip, acute; stamens pale, much shorter than the style, purplish above; stigma-lobes narrow; fruit red, clavate; seeds blackish brown, the surface deeply pitted.

Type locality: Not cited.

Distribution: In the highlands of the Rio Grande, Texas; Nuevo León and Coahuila to Chihuahua and Zacatecas, Mexico.

This species is widely grown in collections but the flowers are inconspicuous.

In the Engelmann Collection, now in the Missouri Botanical Garden, is a specimen labeled "*Mammillaria pottsii vera*—original coll. Dyck. Jan. 1857." This proves to be identical with the plant well known in our collections as *M. leona.* With specimens of this plant in hand Salm-Dyck's description, which heretofore we had not understood, is clearly interpreted, except that he states that the tubercle is slightly sulcate above. From the fact that Engelmann says that his species is "*M. pottsii vera*" we suspect that he may have had a plant like *M. tuberculosa* mixed with it. This seems to have been Poselger's idea, for he refers the plant to *Echinocactus,* doubtless on account of this supposed groove. The plant which Poselger describes under *Echinocactus pottsianus,* collected at Guerrero, south of the Rio Grande, is very different from Salm-Dyck's plant; his fragment, also deposited in the Missouri Botanical Garden, consists of a fruit, a few brownish seeds, and a spine-cluster, one attached to the top of a grooved tubercle, and is to be referred to *Escobaria tuberculosa,* or a related species. The specimen is too fragmentary to identify definitely. Poselger's misunderstanding of Salm-Dyck's plant left the way open for his species, *Mammillaria leona,* described shortly afterwards.

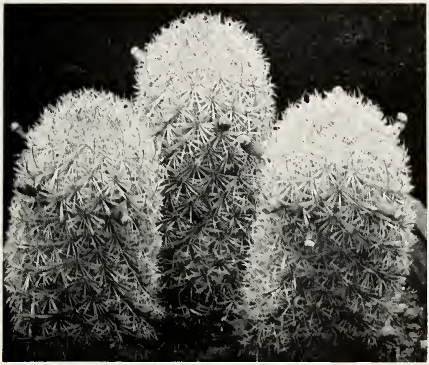

FIG. 150.—Neomammillaria pottsii.

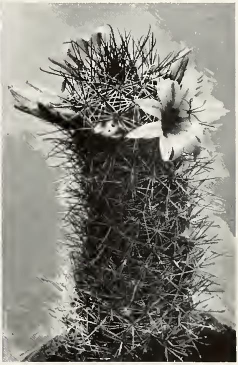

FIG. 151.—N. mazatlanensis.

The description of the flower and fruit as given by Coulter is doubtless taken from Poselger but does not apply to the true *M. pottsii.* Our only Texas record is based on J. H. Ferriss's plant from the Big Bend of the Rio Grande, November 15, 1922.

Coryphantha pottsii occurs in C. R. Orcutt's Circular to Cactus Fanciers 1922 (unsigned and undated) to which he assigns *M. leona.*

Illustrations: Ann. Rep. Smiths. Inst. **1908**: pl. 2, f. 3; Blanc, Cacti 70. No. 1359, as *Mammillaria leona.*

Figure 150 is from a photograph of a cluster of plants obtained in Zacatecas by F. E. Lloyd in 1908.

100. Neomammillaria mazatlanensis (Schumann).

Mammillaria mazatlanensis Schumann, Monatsschr. Kakteenk. *11:* 154. 1901.
Mammillaria littoralis K. Brandegee, Kew Bull. Misc. Inf. *1908:* App. 91. 1908.

Plants cespitose, often forming broad clumps with many oblong heads, 4 to 10 cm. long, about 2 cm. in diameter; tubercles terete, 3 to 4 mm. long, their axils naked; radial spines 12 to 15, setaceous, spreading, white; central spines 4 to 6,* stouter than the radials, reddish, ascending, 8 to 10 mm. long; flowers from the axils of the old tubercles but towards the top of the plant, 3 cm. long or more, red; perianth-segments oblong, spreading; stigma-lobes 8, very long and slender.

Type locality: Mazatlán.

Distribution: On the hills near the sea, about Mazatlán, Mexico.

Dr. Rose collected this plant in 1897 and again in 1910. From this last collection we still have growing plants, but these have never flowered.

Mammillaria littoralis K. Brandegee, first mentioned in 1907 (Monatsschr. Kakteenk. **17**: 80), seems never to have been described by Mrs Brandegee but was described in the Kew Bulletin as mentioned above, where it was stated to be from "California(?)." It was doubtless sent by Mrs. Brandegee from California but collected at Mazatlán.

Illustration: Monatsschr. Kakteenk. **15**: 155, as *Mammillaria mazatlanensis.*

Figure 151 is from a photograph sent by L. Quehl, showing a flowering plant.

101. Neomammillaria sphacelata (Martius).

Mammillaria sphacelata Martius, Nov. Act. Nat. Cur. *16:* 339. 1832.
Echinocactus sphacelatus Poselger, Allg. Gartenz. *21:* 107. 1853.
Cactus sphacelatus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Usually densely cespitose, often grayish, forming clumps 3 to 4 dm. in diameter, the individual plants cylindric, more or less elongated, often 1 to 2 dm. high; radial spines 14 to 20, usually white with black tips; central spines 3 or 4, usually black or reddish throughout, sometimes becoming white in age; axils of tubercles often bearing tufts of short hairs and occasionally a few bristles; flowers about 15 mm. long, purplish; fruit red, clavate; seeds black, the surface deeply pitted.

Type locality: Mexico, possibly in Oaxaca or Puebla; it was collected by Karwinsky.

Distribution: Puebla and Oaxaca; Schumann reports it, but doubtless erroneously, from Hidalgo (Zimapán) and Sonora (Guaymas).

Illustrations: Nov. Act. Nat. Cur. **16**: pl. 25, f. 1; Monatsschr. Kakteenk. **28**: 74; Grässner, Haupt-Verz. Kakteen **1914**: 36. as *Mammillaria sphacelata.*

102. Neomammillaria albicans sp. nov.

Plants at first globose but becoming cylindric and then 10 to 20 cm. long, up to 6 cm. in diameter, often in clumps of 5 to 15; spines almost hiding the plant body and often pure white; radial spines numerous, short, stiff, widely spreading; central spines several, straight, stiff, often brownish or blackish at tip; spine-areoles when young densely white-woolly; fruit clavate, red, 10 to 18 mm. long; seeds black with basal hilum.

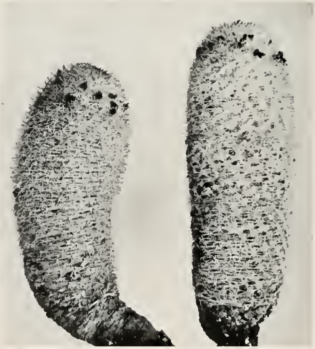

Fig. 152.—Neomammillaria albicans.

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* Sometimes one of the central spines is hooked, as is shown in plants from near the type locality collected by Señor J. G. Ortega in 1922.

Collected on Santa Cruz Island, Gulf of California, by J. N. Rose, April 16, 1911 (No. 16842, type), and by Ivan M. Johnston in 1921 (No. 3912); also on the adjacent island of San Diego by Mr. Johnston (No. 3923).

This is a very beautiful plant which grows in small clusters and is covered with nearly pure white spines. A number of plant were brought back to the New York Botanical Garden in 1911 by Dr. Rose but they have all since died. We now have living plants sent in by Mr. Johnston from two localities.

Figure 152 is from a photograph of a plant sent by Mr. Johnston to Washington from the type locality.

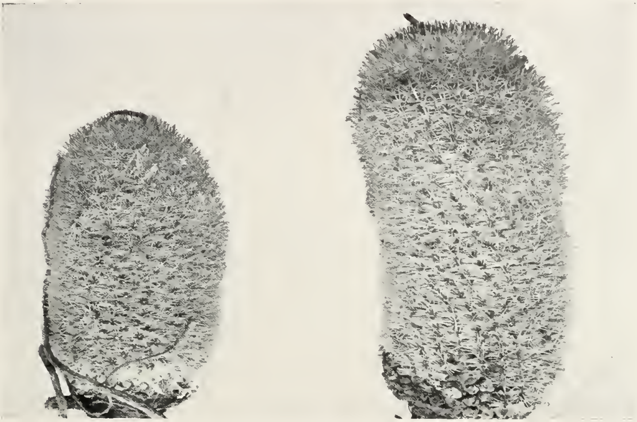

Fig. 153.—Neomammillaria slevinii.

103. Neomammillaria slevinii sp. nov.

Plants simple, cylindric, 1 dm. high or more, 5 to 6 cm. in diameter, entirely hidden under the many closely set spines; spines at top of plant pinkish below, with brown to blackish tips, on lower part of plant bleaching white; radial spines numerous, acicular, widely spreading; central spines about 6, a little longer and stouter than the radials, slightly spreading; flowers about 2 cm. broad; outer perianth-segments with a pinkish mid-rib; inner perianth-segments white; filaments pinkish; style nearly white; stigma-lobes nearly white; fruit red, about 1 cm. long; seeds black, nearly globular, with a projection at base and a large basal hilum.

Collected by J. N. Rose, March 31, 1911 (No. 16550, type), on San Josef Island, and by Ivan M. Johnston in 1921 (No. 3943) on San Francisco Island just off the southern end of San Josef Island.

This species is related to *Neomammillaria albicans*, but it has darker spines and the spine-areoles are not densely lanate.

The plant is named for J. R. Slevin, who was in charge of the scientific expedition of the California Academy of Sciences to the Gulf of California in 1921, at which time the plant was collected.

Figure 153 is from a photograph of one of the plants collected by Mr. Johnston and sent to Washington.

104. Neomammillaria palmeri (Coulter).

Cactus palmeri Coulter, Contr. U. S. Nat. Herb. *3:* 108. 1894.
Mammillaria dioica insularis K. Brandegee, Erythea *5:* 115. 1897.

Densely cespitose; individuals small; axils densely woolly and bristly; radial spines 25 to 30, slender, white, 5 mm. long, radiating; central spines 3 to 5, stouter and longer than the radials, brownish with black tips, straight, 7 to 8 mm. long; flowers cream-colored, sometimes tinged with pink; fruit clavate, scarlet; seeds black.

Type locality: "San Benito Island."*

Distribution: San Benito Islands and possibly Guadalupe Island off the west coast of Lower California.

Plate XIV, figure 7, shows the plant, collected on the San Benito Islands, which flowered in the New York Botanical Garden, April 1, 1912.

105. Neomammillaria uncinata (Zuccarini).

Mammillaria uncinata Zuccarini in Pfeiffer, Enum. Cact. 34. 1837.
Mammillaria bihamata Pfeiffer, Allg. Gartenz. *6:* 274. 1838.
Mammillaria depressa Scheidweiler, Bull. Acad. Sci. Brux. *5:* 494. 1838.
Mammillaria uncinata biuncinata Lemaire, Cact. Gen. Nov. Sp. 96. 1839.
Mammillaria uncinata spinosior Lemaire, Cact. Gen. Nov. Sp. 96. 1839.
Mammillaria uncinata rhodacantha Hortus in Förster, Handb. Cact. ed. 2. 347. 1885.
Cactus bihamatus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus depressus Kuntze, Rev. Gen. Pl. *1:* 260. 1891. Not De Candolle, 1813.
Cactus uncinatus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Globose or somewhat depressed, usually half-buried in the soil, 8 to 10 cm. in diameter; tubercles lactiferous, short, obtuse; axils of old tubercles naked, of young ones lanate, forming a mass of wool at top; young spine-areoles also lanate; radial spines 4 to 6, usually white, subulate, 4 to 5 mm. long; central spines usually solitary, sometimes 2 or 3, much stouter than the radials, 8 to 12 mm. long, brown, hooked at apex; flowers small, reddish white, about 2 cm. long; inner perianth-segments linear-oblong; stigma-lobes pinkish; fruit clavate, 10 to 18 mm. long, red; seeds small, brown.

Type locality: Mexico.

Distribution: Common in central Mexico, especially in Hidalgo and San Luis Potosí. Schumann reports it from Chihuahua, as collected by Wislizenus, but we suspect that there is an error. Pfeiffer does not give a definite locality for this species but Zuccarini, who rediscribed the plant soon afterwards, says that Karwinsky obtained it in the mountains near Pachuca, Mexico.

This species and the following two are the only milk-bearing *Neomammillaria* which have hooked spines.

Mammillaria adunca Scheidweiler (Förster, Handb. Cact. 222. 1846), referred here as a synonym, was never described.

Illustrations: Pfeiffer and Otto, Abbild. Beschr. Cact. **1:** pl. 19; Schumann, Gesamtb. Kakteen f. 94; Abh. Akad. Bayer. Wiss. München **2:** pl. 4, f. 3; Schelle, Handb. Kakteenk. 269. f. 191, as *Mammillaria uncinata.*

106. Neomammillaria hamata (Lehmann).

Cactus cylindricus Ortega, Nov. Rar. Pl. 128. 1800. Not Lamarck, 1783.
Mammillaria hamata Lehmann in Pfeiffer, Enum. Cact. 34. 1837.
Cactus hamatus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

Stem 6 dm. long, cylindric, somewhat branched at base, described as milky; tubercles conic or a little compressed; radial spines 15 to 20, white, spreading; central spines several, brownish, stouter than the radials, one of them hooked; flowers small, probably scarlet, from near top of plant but from axils of old

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* Although San Benito Island is given as the type locality, San Benito is really a group of three small islands. Dr. Rose found this species on two of these islands in 1911 (No. 16042).

tubercles; inner perianth-segments lanceolate, acute; filaments half length of perianth-segments, white; stigma-lobes 4, yellowish; fruit slender, clavate, probably red; seeds minute, brown.

Type locality: Mexico.

Distribution: Mexico, but range not known.

Schumann referred both *Cactus cylindricus* and *Mammillaria hamata* to *M. coronaria,* but the last name must be excluded from this genus. The specific name, *cyindricus,* which has been used four times in the genus *Cactus,* can not be transferred to *Neomammillaria* on account of the earlier use of this specific name by Lamarck.

Mammillaria hamata was first mentioned in the Seed Catalogue of the Hamburg Garden in 1832.

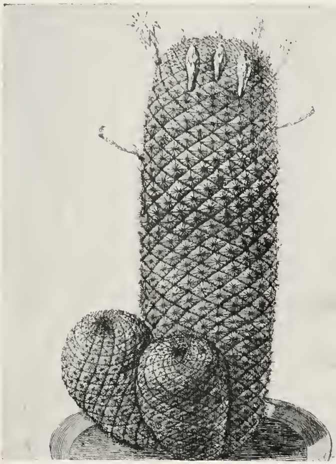


Fig. 154.—Neomammillaria hamata.

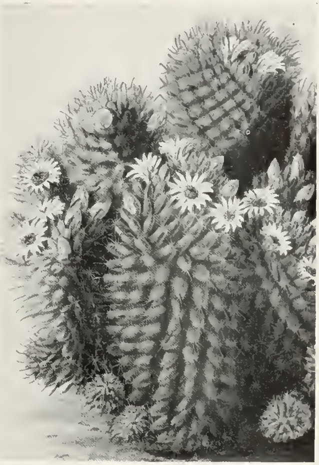


Fig. 155.—Neomammillaria wildii.

The following are usually referred as synonyms of *Mammillaria coronaria,* but probably belong here: *Mammillaria hamata brevispina* and *M. hamata principis* Salm-Dyck (Labouret, Monogr. Cact. 34. 1853) and *M. hamata longispina* Salm-Dyck (Cact. Hort. Dyck. 1844. 8. 1845). *Mammillaria principis* Monville (Labouret, Monogr. Cact. 34. 1853) was given as a synonym of the last variety here cited.

Illustration: Ortega, Nov. Rar. Pl. pl. 16, as *Cactus cylindricus.*

Figure 154 is reproduced from the illustration above cited.

107. **Neomammillaria rekoi** sp. nov.

Globular to short-cylindric, becoming 12 cm. long, 5 to 6 cm. in diameter, sometimes milky; tubercles green, terete, 8 to 10 mm. long, not very closely set, each bearing in its axil a tuft of short white wool and 1 to 8 long white bristles; radial spines spreading, about 20, white, delicately acicular, 4 to 6 mm. long; central spines 4, brown, much stouter than the radials, 10 to 15 mm. long, the lower one sometimes strongly hooked; flowers from axils of old tubercles, near top of plant; 1.5 cm. long, deep purple; inner perianth-segments narrowly oblong, apiculate; filaments and style purplish; stigma-lobes greenish; fruit clavate, red, 12 mm. long; seeds minute, brown.

This species has been sent to us repeatedly from Oaxaca, Mexico, by Dr. B. P. Reko and it has been named in his honor; we have selected as the type his specimen of 1921, which flowered in Washington.

This is a remarkable species, being the only one we know, except the following, which has the characters of watery tubercles, a hooked spine, and brown seeds, but some plants give out a very diluted milk and have no hooked spines.

Dr. Reko sent us a single plant in April 1922, which was about 12 cm. long and short-clavate; the central spines were mostly 4, but sometimes 5, and none of them hooked. In this specimen we obtained a diluted milky juice from the upper tubercles while the lower ones are entirely devoid of milk. It flowered in April 1923 and seemed to be referable here.

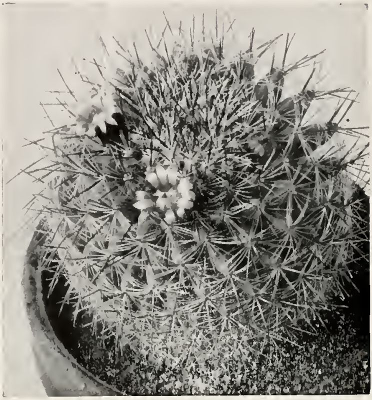


FIG. 155*a*.—Neomammillaria rekoi.

Figure 149 shows a plant sent by Dr. B.P. Reko from Oaxaca, Mexico, in 1919; figure 155*a* shows the plant collected by Dr. Reko in1922, referred to above.

108. Neomammillaria solisii sp. nov.

Simple, globular or nearly so, 5 to 7 cm. in diameter, green or becoming purplish; tubercles 8 mm. long, terete in section, a little narrow towards the tip and thus separated above from the adjoining tubercles, their axils without wool even when quite young, and usually with 1 to many bristles; radial spines about 10 to 20, spreading, 6 to 7 mm. long, white, bristle-like; central spines 3 or 4, a little stouter than the radials, becoming brown, one of them strongly hooked (sometimes 2 cm. long).

Collected by Octavio Solís in Cerro de Buenavista de Cuellar, Guerrero, Mexico, in 1920 (No. 5) and in 1921, type, and at the same station by Professor C. Núñez in April and November 1921 (Nos. 4 and 6).

Figure 156 is from a photograph of a plant sent by Octavio Solís from Guerrero, Mexico, in 1920; figure 157 is from a photograph of a plant sent by Professor C. Núñez in 1922.

109. Neomamillaria pygmaea sp. nov.

Plant very small, globose to cylindric, 2 to 3 cm. in diameter; tubercles small, obtuse; radial spines about 15, white, stiff, hardly puberulent even under a lens; central spines 4, ascending, golden yellow, the lower one hooked, 5 to 6 mm. long; flowers about 1 cm. long, the outer segments tinged with red, apiculate; inner perianth-segments about 10, cream-colored; filaments greenish, much shorter than the perianth-segments; style greenish.

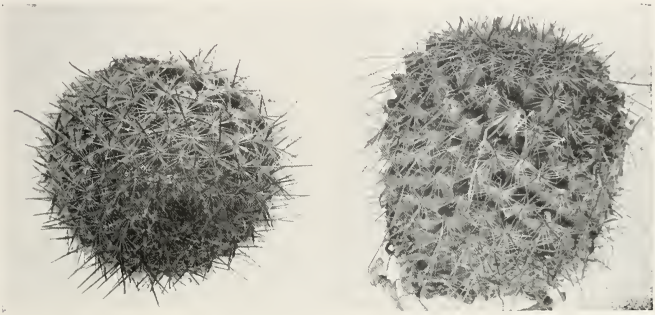
Collected by J. N. Rose near Cadereyta, Querétaro, Mexico, in 1905 (No. 9863). It has repeatedly flowered but was only 3 cm. high in 1921 when it died.

The species is known only from the single collection recorded above. It grows on stony hills in a very arid part of Querétaro. It is very inconspicuous and is easily overlooked in the field.

110. Neomammillaria wildii (Dietrich).

Mammillaria wildii Dietrich, Allg. Gartenz. *4:* 137. 1836.
Mammillaria wildiana Otto in Pfeiffer, Enum. Cact. 37. 1837.
Mammillaria wildiana compacta Hortus in Förster, Handb. Cact. ed. 2. 258. 1885.
Mammillaria wildiana cristata Hortus in Förster, Handb. Cact. ed. 2. 258. 1885.
Cactus wildianus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Cylindric to globose, cespitose at base; axils of tubercles bearing rose-colored hairs and bristles; tubercles slender, elongated, 8 to 10 mm. long, obtuse, green or somewhat rose-colored at base; young areoles tomentose; spines all pubescent; radial spines 8 to 10, 8 mm. long, setiform, white; central spines 4, yellow, one of them hooked; flowers white, 12 mm. in diameter; inner perianth-segments acuminate; stigma-lobes 4 or 5, straw-colored; fruit clavate, red.



Figs. 156 and 157.—Neomammillaria solisii.

Type locality: Mexico.

Distribution: State of Hidalgo, Mexico, according to Schumann.

We have had this plant growing for a number of years, obtained from other collectors, but we do not know its natural habitat. It sprouts freely and new plants are easily started. Dr. Rose examined a specimen, labeled *Mammillaria wildii,* in the Botanical Garden at Halle in 191; we have a cluster of spines and a flower of that plant.

Mammillaria glochidiata aurea (Pfeiffer, Enum. Cact. 37. 1837), although never described, is referred usually as a synonym of this species. The two varieties of *Mammillaria wildii, cristata and compacta,* are listed but not described by Schelle (Handb. Kakteenk. 251. 1907), the latter being offered for sale by Grässner in his Kakteen for 1914 as form *cristata.*

The two varieties, *Mammillaria wildiana major* and *M. wildiana spinosior,* were given by Walpers (Repert. Bot. 2: 270. 1843) as synonyms of *M. wildiana.* The variety *monstrosa* Cels was given by Rümpler (Förster, Handb. Cact. ed. 2. 258. 1885) as a synonym of *M. wildiana cristata.*

Illustrations: Blühende Kakteen **2:** pl. 64; Monatsschr. Kakteenk. **32:** 103, as *Mammillaria wildii;* Grässner, Haupt-Verz. Kakteen **1912:** 27, as *M. wildii cristata.*

Plate XIV, figure 8, shows a plant from the Missouri Botanical Garden which flowered in the New York Botanical Garden, April 25, 1913. Figure 155 is reproduced from the first illustration cited above.

111. Neomammillaria seideliana (Quehl).

Mammillaria seideliana Quehl, Monatsschr. Kakteenk. *21:* 154. 1911.

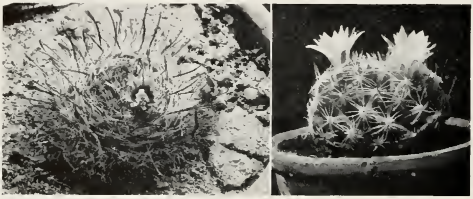
Solitary, globose, becoming cespitose, 3 to 4 cm. in diameter; tubercles purplish, their axils naked; radial spines 20 to 25, white, long and slender, ascending, puberulent; central spines yellow, 3 or 4, puberulent when young, one hooked; flowers arising from near top of plant, about 15 to 18 mm. long, creamy yellow; outer perianth-segments brownish; inner perianth-segments oblong, acute; style cream-colored, much longer than stamens; stigma-lobes 5 or 6, cream-colored, obtuse; fruit persisting in axils of tubercles, apparently for a number of years; seeds black, with thick neck at base; the hilum basal, large.

Type locality: Zacatecas, Mexico.

Distribution: Known only from the state of Zacatecas.

Collected by F. E. Lloyd in Zacatecas, Mexico, in 1908 (No. 54), who states that he found but a single specimen, though he made diligent search for others.

Although the flowers appear to come from near the top of the plant they are all from axils of old tubercles. In the single specimen examined the flowers appeared before the plant began to form new tubercles. In *Mammillaria barbata*, a closely related species, the flowers occur at both the old and new tubercles, but so far as known no other species possesses that character, although there is no good reason for not finding it in closely related species.



FIGS. 157*a* and 158.—Neomammillaria seideliana.

We have also had a plant sent us by Haage and Schmidt; it is a profuse bloomer.

Illustration: Monatsschr. Kakteenk. **21:** 155, as *Mammillaria seideliana.*

Figure 157*a* is from a photograph of a plant sent us from Zacatecas, Mexico, by Professor Lloyd in 1908; figure 158 is from a photograph sent by L. Quehl.

112. Neomammillaria barbata (Engelmann).

Mammillaria barbata Engelmann in Wislizenus, Mem. Tour North. Mex. 105. 1848.
Cactus barbatus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

Often densely cespitose, globose, 3 to 4 cm. in diameter; radial spines 20 or more, acicular, spreading or ascending, white, sometimes with brown tips; central spines several, subulate, brown, puberulent, 1 or 2 hooked; flowers 15 mm. long; outer perianth-segments ovate to lanceolate, ciliate; inner perianth-segments erect or spreading at tip, light straw-colored or greenish, brown without, acute; filaments numerous, short, purplish; stigma-lobes 5 to 7, greenish.

Type locality: Cosihuirachi, Mexico.

Distribution: Western Chihuahua, Mexico.

This species was collected by Dr. Wislizenus in 1846 and rediscovered and collected at the type locality in 1908 by Dr. Rose, and upon this latter collection the above description is based. Schumann did not recognize the species, but thought that it might be near *Mammillaria grahamii.*

Illustrations: Cact. Mex. Bound. pl. 6, f. 9 to 12; Monatsschr. Kakteenk. **20:** 181; Gartenflora **34:** pl. 1208, f. a, b, c; **43:** pl. 1400, as *Mammillaria barbata.*

Figure 159 is from a photograph of the specimen collected by Dr. Rose in 1908 at the type locality.

113. Neomammillaria mercadensis (Patoni).

Mammillaria mercadensis Patoni, Alianza Cientifica Universal *1:* 54. 1910.
Mammillaria ocamponis Ochoterena, Bol. Direccion Estudios Biol. *2:* 355. 1918.

Solitary or cespitose, small, globose; radial spines numerous, sometimes 25, widely spreading, white; central spines 4 or 5, elongated, much longer than the flowers, one of them strongly hooked at apex; flowers small, pale rose-colored; perianth-segments oblong, obtuse.

Type locality: Cerro de Mercado, Durango.

Distribution: Durango, Mexico.

We know this plant only from descriptions and illustrations.

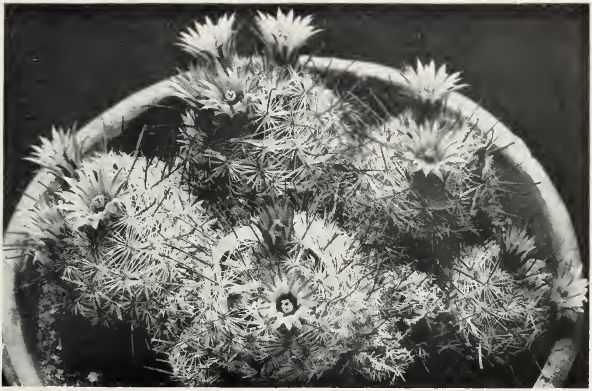


FIG. 159.—Neomammillaria barbata.

Illustrations: Alianza Cientifica Universal **3:** pl. facing 223, as *Mammillaria barbata;* Bol. Direccion Estudios Biol. **2:** facing 356, as *Mammillaria ocamponis.*

Figure 160 is from a photograph of the type plant, which has the same origin as the illustrations cited above.

114. Neomammillaria kunzeana (Bödeker and Quehl).

Mammillaria kunzeana Bödeker and Quehl, Monatsschr. Kakteenk. *22:* 177. 1912.
Mammillaria bocasana kunzeana Quehl, Monatsschr. Kakteenk. *26:* 46. 1916.

Cespitose, globose or sometimes becoming cylindric, light green; tubercles cylindric, setose in their axils; radial spines about 25, white, setaceous; central spines 3 or 4, brown, puberulent, one of them hooked; flowers white or yellowish white, rose-colored on the outside, 2 cm. long; inner perianth-segments acuminate; stigma-lobes 4, whitish yellow.

Type locality: Mexico.

Distribution: Mexico, but range unknown.

This species is dedicated to Dr. Richard Ernest Kunze (1838-1919), who was an enthusiastic student of cacti and for many years a resident of Phoenix, Arizona. He sent the plant to Germany in 1910.

Illustration: Monatsschr. Kakteenk. 22: 178, as *Mammillaria kunzeana.*

Plate XIV, figure 1, is of a plant obtained by Dr. Rose in 1912 from W. Mundt as *Mammillaria bocasana,* which flowered in the New York Botanical Garden, April 21, 1914.

115. Neomammillaria hirsuta (Bödeker).

Mammillaria hirsuta Bödeker, Monatsschr. Kakteenk. *29:* 130. 1919.

Solitary or becoming cespitose, globose, about 6 cm. in diameter; tubercles 10 mm. long, in 8 or 13 spiraled rows, cylindric, their axils setose; spine-areoles naked; radial spines about 20, white, 10 to 15 mm. long; central spines 3 or 4, the lower one hooked; flowers small, 10 mm. long; fruit and seeds unknown.

Type locality: Mexico.

Distribution: Mexico, but range unknown.

The plant was exhibited by de Laet at Contich, Belgium, in 1914, as sent to him by Mrs. Nichols, presumably from northern Mexico.

Illustration: Monatsschr. Kakteenk. **29:** 131, as *Mammillaria hirsuta.*

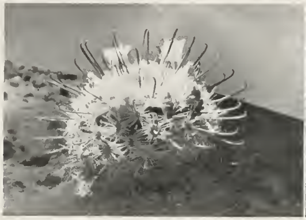


FIG. 160.—Neomammillaria mercadensis.

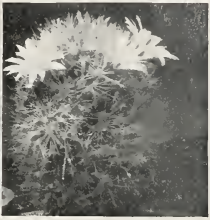


FIG. 161.—N. multihamata.

116. Neomammillaria multihamata (Bödeker).

Mammillaria multihamata Bödeker, Monatsschr. Kakteenk. *25:* 76. 1915.

Short-cylindric, about 5 cm. in diameter; tubercles cylindric, setose in their axils; spine-areoles white-lanate; radial spines 25, acicular, white, 8 mm. long; central spines 7 to 9, several of them hooked; flowers numerous from near top of plant, small, 1.5 cm. long; inner perianth-segments narrow, acute, spreading; seeds blackish brown.

Type locality: Mexico.

Distribution: Mexico, but range unknown.

This plant is in the trade. A specimen was sent us in 1914 by L. Quehl, but it never flowered and soon died.

Illustration: Monatsschr. Kakteenk. **25:** 77, as *Mammillaria multihamata.*

Figure 161 is reproduced from a photograph furnished by L. Quehl.

117. Neomammillaria longicoma sp. nov.

Cespitose, often forming broad clumps; individual specimens 3 to 5 cm. in diameter; tubercles conic, 4 to 5 mm. long, dark green, obtuse, bearing long white hairs in their axils; radial spines 25 or more, weak and hair-like, more or less interlocking; central spines 4, 10 to 12 mm. long, brown above, a little paler below, 1 or 2 hooked; flowers from axils of upper tubercles; outer perianth-segments pinkish, darker along the center; inner perianth-segments lanceolate, acute, nearly white or sometimes tinged with rose; stamens and style much shorter than the inner perianth-segments; stigma-lobes 3, cream-colored.

The plant is common about San Luis Potosí, Mexico, where it was collected by Dr. E. Palmer in 1905 (type) and by Mrs. Irene Vera in 1912. We have had it in cultivation since

1905. It differs considerably from *Neomammillaria kunzeana,* from the same region, in its hair-like radial spines. It is perhaps nearest *M. bocasana,* but that species has single central spines.

Illustration: Ann. Rep. Smiths. Inst. **1908:** pl. 4, f. 4, as *Mammillaria bocasana.*

Figure 162 is from a photograph of a plant (type) collected by Dr. E. Palmer near San Luis Potosí in 1905 and figure 165 shows a cluster of plants from the same colony.

118. Neomammillaria bocasana (Poselger).

Mammillaria bocasana Poselger, Allg. Gartenz. *21:* 94. 1853.
Cactus bocasanus Coulter, Contr. U. S. Nat. Herb. *3:* 104. 1894.

Cespitose, often forming large mounds; individual plants globose, 3 to 4 cm. in diameter, light green; tubercles slender, 6 to 8 mm. long, terete, their axils sometimes hairy or bristly; radial spines represented by numerous long white silky hairs; central spines solitary, 5 to 8 mm. long, brown, but paler at base, hooked, much shorter than the radial hairy ones; flower-buds rose-colored; flowers described as white; perianth-segments lanceolate-linear, acute, spreading; fruit "green, 4 mm. long; seeds cinnamon brown, oblique, broadly obovate, with narrowly basal hilum."

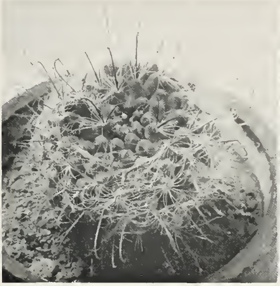


FIG. 162.—Neomammillaria longicoma.

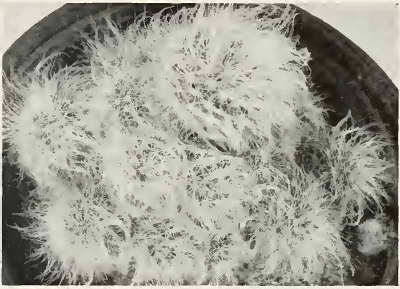


FIG. 163.—Neomammillaria bocasana.

Type locality: Sierra de Bocas,* Mexico.

Distribution: Northern central Mexico, especially in San Luis Potosí.

This species has not been well understood and is usually misnamed in collections.

The two varieties of *Mammillaria bocasana, cristata* and *glochidiata,* are listed by Schelle (Handb. Kakteenk. 250. 1907), but not described. The former is offered for sale by Grässner in his Kakteen for 1914. We do not find that *M. bocasana splendens* Liebner and *M. bocasana sericata* Lemaire, mentioned by Quehl (Monatsschr. Kakteenk. **19:** 46. 1909), have ever been described.

Mammillaria schelhasei lanuginosior Hildmann (Schumann, Gesamtb. Kakteen 531. 1898) we have not seen but it may belong here.

Mammillaria bocasana splendens, credited to Schlechtendal, is offered for sale by Haage and Schmidt in their 1922 Catalogue.

Illustrations: Schelle, Handb. Kakteenk. 250. f. 170; Blanc, Cacti 67, No. 1148; West Amer. Sci. **13:** 40 (these three illustrations are from the same source); Blühende Kakteen **1:** pl. 35; Monatsschr. Kakteenk. **31:** 103; Schumann, Gesamtb. Kakteen f. 89, as *Mammillaria bocasana;* De Laet, Cat. Gén. 28. f. 42; Schelle, Handb. Kakteenk. 251. f. 171; Rev. Hort.

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* Coulter (Contr. U. S. Nat. Herb. *3:* 104) states that Poselger says the plant is from Texas "auf der Seira de Bocas," but in the original place of publication he does not give the state. Bocas, however, is in San Luis Potosí.

Belge. **40:** after 186; Tribune Hort. **4:** pl. 139 (these four illustrations are all from the same source); Möllers Deutsche Gärt. Zeit. **25:** 475. f. 8, No. 25; Monatsschr. Kakteenk. **29:** 81, as *Mammillaria bocasana cristata.*

Plate XIV, figure 2, shows a plant, collected by S. S. Hordes in 1915, which flowered in the New York Botanical Garden, May 11, 1916. Figure 163 shows a plant received from San Luis Potosí through Mrs. Irene Vera in 1912.

119. **Neomammillaria multiformis** sp. nov.

Cespitose, forming dense clumps, sometimes 25 or more from a single root, either globose or much elongated and 3 to 6 times as long as thick; tubercles terete, 6 to 8 mm. long, their axils bearing long white bristles and white wool; radial spines 30 or more, acicular, 8 mm. long, yellow or at least becoming so, ascending; central spines 4, a little longer and stouter than radials, nearly erect, reddish in upper part, one of them strongly hooked; flowers deep purplish red, 8 to 10 mm. long, usually broader than long; inner perianth-segments oblong, acute; filaments red; fruit nearly globose, at least when dry; seeds black.

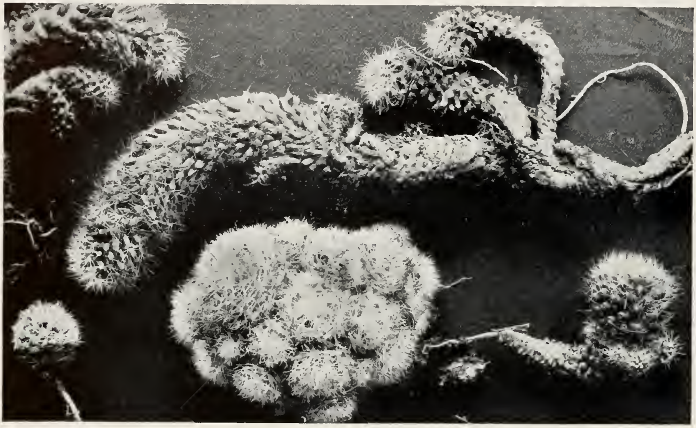

FIG. 164.—Neomammillaria multiformis.

Collected by Dr. E. Palmer at Alvarez, near San Luis Potosí, Mexico, in May 1905 (No. 591, type, and No. 592).

Figure 164 is from a photograph made from Dr. Palmer's specimen just after it was received in Washington.

120. **Neomammillaria scheidweileriana** (Otto).

Mammillaria glochidiata sericata Lemaire, Cact. Gen. Nov. Sp. 40. 1839.
Mammillaria scheidweileriana Otto in Dietrich, Allg. Gartenz. *9:* 179. 1841.
Mammillaria wildiana rosea Salm-Dyck, Cact. Hort. Dyck. 1849. 81. 1850.
Cactus scheidweilerianus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Mammillaria monancistria * Berg in Schumann, Gesamtb. Kakteen 533. 1898.

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* The publication of *Mammillaria monancistria* is usually referred to Förster's Handbuch (254. 1846), but the name occurs there without description.

Cespitose, globose to cylindric, light green; tubercles setose in their axils, in 8 and 13 spirals, cylindric; spines all puberulent; radial spines 9 to 11, setaceous, white, 1 cm. long; central spine, 1 to 4, brown, 1 or 2 hooked; flowers rose-colored, 12 to 13 mm. long.

Type locality: Mexico.

Distribution: Mexico, but range unknown.

The plant is known to us from description only.

121. Neomammillaria saffordii sp. nov.

Plants small, globose to short-cylindric, 3 to 4 cm. high, dull green, nearly hidden under the dense covering of spines; axils naked; spine-areoles when quite young slightly woolly, but early glabrate, circular; spines all puberulent under a lens when young; radial spines 12 to 14, somewhat ascending, but in age more or less curved outward, when just developing with bright red tips and white bases, later the lower part becoming yellowish; central spines single, stout, reddish, 1.5 cm. long, hooked at apex; flower 2.5 cm. long, rose-colored; outer perianth-segments tipped by long bristles, the inner obtuse; stigma-lobes green.

This beautiful little species was collected by W. E. Safford, February 3, 1907, near Icamole, Nuevo León (No. 1250). Two plants, which were sent to Washington, flowered June 21, 1912; but they have not done well in cultivation. The plants sprout freely in cultivation and in this way we hope to distribute material to other collections. It is near *Mammillaria carretii* and was so figured by Dr. Safford, but it differs in several important respects from that species. It is named for Dr. Safford, the author of a very interesting paper, entitled Cactaceae of Northeastern and Central Mexico (Ann. Rep. Smiths. Inst. 1908), frequently referred to in these volumes.

Illustration: Ann. Rep. Smiths. Inst. **1908:** pl. 4, f. 2, as *Mammillaria carretii.*

Figure 168 is from a photograph of the type plant.

122. Neomammillaria schelhasei (Pfeiffer).

Mammillaria schelhasii Pfeiffer, Allg. Gartenz. *6:* 274. 1838.
Mammillaria glochidiata purpurea Scheidweiler, Bull. Acad. Sci. Brux. *5:* 495. 1838.
Cactus schelhasii Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Cespitose, forming a large hemispheric mound; individual plants globose to short-cylindric, olive-green; tubercles cylindric, their axils a little woolly, but not setose; radial spines 14 to 16, setaceous, white; central spines 3, brown, one hooked at apex; flowers large, 2.2 to 2.5 cm. long, salmon or rose-colored (Nicholson says white with line of rose down each petal); fruit 5 mm. long.

Type locality: Mineral del Monte, Mexico.

Distribution: Hidalgo, Mexico.

Salm-Dyck (Cact. Hort. Dyck. 1849. 7, 81. 1850) describes the three following varieties: *sericata, rosea,* and *triuncinata,* some of which may belong elsewhere. Of these Schumann recognizes only the last. The first Lemaire has referred to a different species, *Mammillaria glochidiata sericata* Lemaire (Cact. Gen. Nov. Sp. 40. 1839).

Illustrations: Schelle, Handb. Kakteenk. 252. f. 172; Dict. Gard. Nicholson 4: 565. f. 37; Suppl. 518. f. 555; Förster, Handb. Cact. ed. 2. 254. f. 24 (32, in error); Rümpler, Sukkulenten 198. f. 111; Watson, Cact. Cult. 173. f. 69; ed. 3. f. 47; Knippel, Kakteen pl. 25; Blühende Kakteen **3:** pl. 170; Monatsschr. Kakteenk. **30:** 163, as *Mammillaria schelhasei;* Gartenflora 6: pl. 207, as *M. schelhasei sericata.*

123. Neomammillaria glochidiata (Martius).

Mammillaria glochidiata Martius, Nov. Act. Nat. Cur. *16:* 337. 1832.
?*Mammillaria ancistroides* Lehmann, Del. Sem. Hort. Hamb. 1832.
Cactus glochidiatus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus ancistrodes Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Densely cespitose, forming clusters sometimes 15 cm. high; tubercles cylindric, green, shining, 8 to 15 mm. long, well separated from one another towards the tip, obtuse, terete; radial spines 12 to 15, widely spreading, puberulent, white, setiform, 10 to 12 mm. long; central spines 4, brownish, one of them hooked; flowers white; inner perianth-segments lanceolate, acuminate; style longer than the stamens; stigma-lobes 4 or 5, yellow; fruit clavate, scarlet, 16 mm. long; seeds black.

Type locality: Mexico.

Distribution: Southern Mexico.

Martius, who described this species, based it on a plant of Karwinsky, but did not cite a definite locality; Hemsley, however, records Karwinsky's plant as from near San Pedro Nolasco, Hidalgo, at 7,000 to 8,000 feet altitude.

As it is a high mountain species it would doubtless not remain long in cultivation. Pfeiffer refers here *Mammillaria criniformis* De Candolle (Mém. Cact. 8. pl. 4. 1834) and transfers his two varieties *rosea* and *albida* to *M. glochidiata* as variety *rosea* and *albida* (Enum. Cact. 37. 1837). *Mammillaria criniformis* must be very different, for it has only 8 to 10 radial spines and one central spine, and this yellow. The two varieties also may belong elsewhere; in fact, the variety *rosea* has been referred to *Mammillaria decipiens.*

Mammillaria ancistrata Schelhase (Salm-Dyck, Cact. Hort. Dyck. 1844. 8. 1845), given as a synonym of *M. ancistroides* Lemaire, is referred here by Schumann, perhaps wrongly.

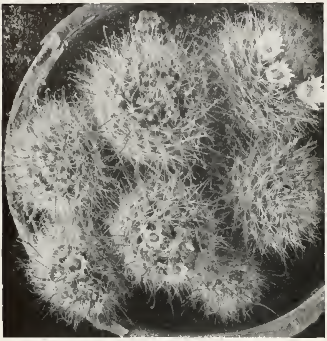


FIG. 165.—Neomammillaria longicoma.

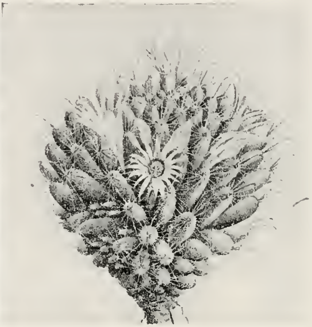


FIG. 166.—Neomammillaria glochidiata.

Mammillaria ancistrina Hortus (Salm-Dyck, Cact. Hort. Dyck. 1849. 10. 1850) was given as a synonym of *M. ancistroides.*

To *Mammillaria ancistroides major* (Salm-Dyck, Cact. Hort. Dyck. 1844. 8. 1845) was referred *M. ancistrata* as a synonym. Afterwards it was briefly described in Förster's Handbuch.

Mammillaria bergeana, a name from Hildmann's Catalogue, is referred as a synonym of *M. glochidiata* (Schumann, Gesamtb. Kakteen 532. 1898), and so also is *M. glochidiata alba* (Förster, Handb. Cact. 188. 1846).

Mammillaria ancistroides Lehmann (Delect. Sem. Hort. Hamb. 1832) is usually referred to this species but it must go elsewhere; it has setae in the axils of the tubercles, the radial spines are 6 to 8, and the hooked spine is brown at tip.

Schumann (Gesamtb. Kakteen 532. 1898) describes two varieties, *crinita* and *prolifera.* The former is based on *Mammillaria crinita* De Candolle (Mém. Mus. Hist. Nat. Paris **17:** 112. 1828; *Cactus crinitus* Kuntze, Rev. Gen. Pl. **1:** 260. 1891), and has the central spines straight (at least so shown in the illustration, but described as hooked), and must be excluded from this species. *Mammillaria crinita pauciseta* De Candolle (Mém. Mus. Hist. Nat. Paris **17:** 112. 1828) may be of this relationship but we do not know it.

Other varietal names have been given, such as *M. glochidiata alba* (Förster, Handb. Cact. 188. 1846).

Illustrations: Blühende Kakteen **2:** pl. 82; Nov. Act. Nat. Cur. **16:** pl. 23, f. 1; Abh. Bayer. Akad. Wiss. München **2:** pl. 1, I. f. 4; Monatsschr. Kakteenk. **29:** 141, as *Mammillaria glochidiata.* The following illustrations we have not placed: De Candolle, Mém. Cact. pl. 3; Krook, Handb. Cact. 38, as *M. crinita;* De Candolle, Mém. Cact. pl. 4, as *M. criniformis.*

Figure 166 is reproduced from the original illustration of the type as shown in the second illustration cited above.

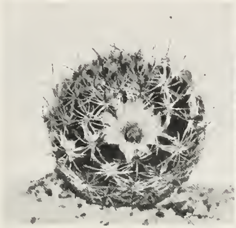


FIG. 167.—Neomammillaria trichacantha.

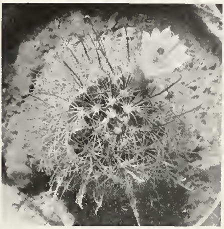


FIG. 168.—Neomammillaria saffordii.

124. Neomammillaria trichacantha (Schumann).

Mammillaria trichacantha Schumann, Gesamtb. Kakteen Nachtr. 133. 1903.

Solitary, globose to short-cylindric, small; tubercles small, clavate, 4 to 5 cm. high, slightly glaucous; radial spines 15 to 18, pubescent, acicular, white, 8 mm. long; central spines 2, brownish, 12 mm. long, one of them hooked; flowers red or yellow, 1.5 cm. long; inner perianth-segments lanceolate, widely spreading, acuminate; style pale green; stigma-lobes white.

Type locality: Not cited.

Distribution: Undoubtedly Mexico, but known only from cultivated plants.

The relationship of this species is somewhat uncertain. Schumann placed it next to *Mammillaria carretii* and described the flowers as red, while Quehl stated that the inner perianth-segments are pale yellow, and this is clearly shown by an unpublished study of Mrs. Gürke, made May 26, 1907, now in our possession. We have received such flowers from Quehl.

Quehl refers here *Mammillaria hamuligera* (sometimes written *M. lamuligera*) while Bödeker would keep it distinct. We have received flowers from Quehl which correspond with Mrs. Gürke's painting of *M. trichacantha,* but her plant may be different from Schumann's type, which had red flowers.

Illustrations: Schumann, Gesamtb. Kakteen Nachtr. 133. f. 33; Monatsschr. Kakteenk. **14:** 45, as *Mammillaria trichacantha.*

Figure 167 is reproduced from the first illustration cited above.

125. Neomammillaria painteri (Rose).

Mammillaria painteri Rose in Quehl, Monatsschr. Kakteenk. *27:* 22. 1917.
Mammillaria erythrosperma Bödeker, Monatsschr. Kakteenk. *28:* 101. 1918.
Mammillaria erythrosperma similis De Laet in Bödeker, Monatsschr. Kakteenk. *28:* 102. 1918.

Plant globose, small, 2 cm. in diameter, almost hidden by the spines; tubercles without bristles in their axils; radial spines about 20, stiff, white, puberulent under a hand lens; central spines 4 or 5, ascending, dark brown, one hooked, puberulent; flowers 15 mm. long, greenish white, the outer segments brownish; inner perianth-segments broad, with an ovate acute tip; stamens white; stigma-lobes cream-colored.

Type locality: Near San Juan del Río, Querétaro.

Distribution: Central Mexico.

Collected in Querétaro,, Mexico, in 1905 by J. N. Rose. It has flowered repeatedly in cultivation (August 1909, June 1911, 1912, April 1915), and is nearest perhaps to *Neomammillaria kunzeana* and *N. multihama,* but the axils of the tubercles are naked.

Illustrations: Monatsschr. Kakteenk. **27:** 23, as *Mammillaria painteri;* Monatsschr. Kakteenk. **28:** 103, as *M. erythrosperma* and var. *similis.*

Figure 169 is from a photograph of the type plant.

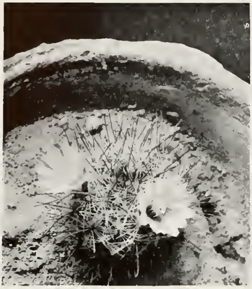


FIG. 169.—Neomammillaria painteri.

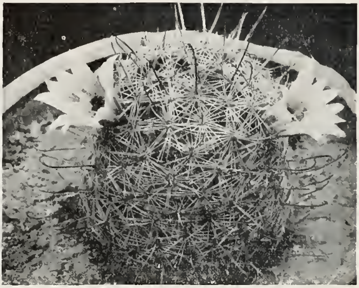


FIG. 170.—Neomammillaria microcarpa.

126. Neomammillaria wrightii (Engelmann).

Mammillaria wrightii Engelmann, Proc. Amer. Acad. *3:* 262. 1856.
Cactus wrightii Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Depressed-globose, simple; tubercles terete, 10 to 12 mm. long, with naked axils; radial spines 8 to 15, white, spreading, acicular; central spines 1 to 3, stouter than the radials, brown to black, 1 or sometimes 2 or 3 hooked at apex; flowers large, 25 mm. long and as broad as long when expanded; outer segments about 13, triangular-obtuse, fimbriate; inner perianth-segments bright purple; fruit obovoid, large, 25 mm. long, purple; seeds 1.5 mm. long, black, with a narrow ventral hilum.

Type locality: Anton Chico on the Pecos east of Santa Fé, New Mexico.

Distribution: Mountains of northeastern New Mexico.

Mammillaria wrightii as described by Dr. Engelmann is complex, his original description being based on two collections, one from the upper Pecos, the type, and one from the Santa Rita Copper mines in southwestern New Mexico. This latter specimen is referable to a new species described below. There has always existed much confusion regarding *M. wrightii,* and several species have been distributed under that name. It is very rare in collections. In the National Herbarium we have only a part of the type (3 clusters of spines) and spines and fruit collected by J. W. Toumey at White Oaks, New Mexico, October 20, 1896. Engelmann cites a specimen in Mexico (near Lake Santa Maria) which doubtless is to be referred elsewhere.

This species was named for Charles Wright (1811-1855), who explored extensively in Texas and Cuba.

Illustrations: Cact. Mex. Bound. pl. 8, f. 1 to 8; Monatsschr. Kakteenk. 14: 9; Möllers Deutsche Gärt. Zeit. 25: 475. f. 8, No. 5; West Amer. Sci. 13: 40; Förster, Handb. Cact. ed. 2. 249. f. 23 (as f. 31, in error); Schelle, Handb. Kakteenk. 255. f. 177; Remark, Kakteenfreund 16, 17, as *M. wrightii.*

Figure 171 is a reproduction of the first illustration cited above.

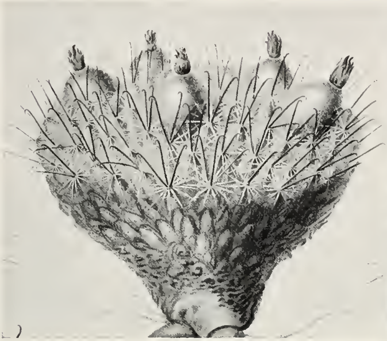


FIG. 171.—Neomammillaria wrightii.

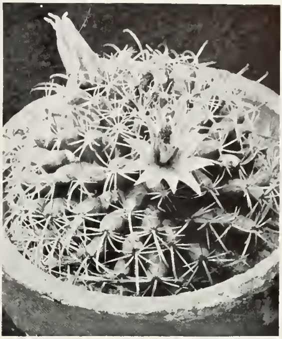


FIG. 172.—Neomammillaria mainae.

127. **Neomammillaria viridiflora** sp. nov.

Globular to short-oblong, 5 to 10 cm. long, the plant-body well hidden under the closely appressed radial spines; tubercles terete, small, naked in their axils; radial spines 20 to 30, widely spreading, white with brown tip, bristle-like, 10 to 12 mm. long; central spines much stouter than the radials, 1.5 to 2 cm. long, brown, one or more of them hooked; flowers greenish, narrowly campanulate, 1.5 cm. long; fruit globose to ovoid, 10 to 15 mm. long, purplish, very juicy; seeds minute, 1 mm. long.

Collected by C. R. Orcutt on Superior-Miami Highway, near Boundary Monument, between Pinal and Gila counties, Arizona, 4,700 feet elevation, July, 1922 (No. 608, type), and by Mrs. Ruth C. Ross near Tula Spring, south of Aravaipa, Arizona, June 1922 (No. 14).

Here perhaps are to be referred plants collected in New Mexico by O. B. Metcalfe (Nos. 797, 803, and 820) and probably that part of *Mammillaria wrightii* which came from Santa Rita. Mr. Orcutt has repeatedly written to us about this green-flowered species, which we are now able to separate very distinctly from both *M. wrightii* and *M. wilcoxii.*

Dr. Forrest Shreve has also reported a green-flowered species from Arizona which he states is common in oak-woods.

128. **Neomammillaria wilcoxii** (Toumey).

Mammillaria wilcoxii Toumey in Schumann, Gesamtb. Kakteen 545. 1898.

Solitary, almost globose, flabby in texture, 10 cm. in diameter, almost covered by a mass of interlocking spines; axils of tubercles naked; radial spines 14 to 20, widely spreading, often 15 mm. long, bristle-like, white with colored tips; central spines 1 to 3, brown, 2 cm. long, 1 or more hooked; flowers pink to purple, large, 3 cm. long, 4 cm. broad when fully expanded; outer perianth-segments about 20, fringed with white hairs; inner perianth-segments about 40, in 2 rows.

Type locality: Arizona.

Distribution: Southeastern Arizona. It should be looked for in northern Sonora.

This species is very rare in living collections and in herbaria. When found in the field it is often associated with *Mammillaria grahamii* and *Coryphantha aggregata*, which has led to the suggestion that it might be a hybrid between these species.

The plant is named for General Timothy E. Wilcox, U. S. A., who collected extensively in Arizona, Oklahoma, Washington, and Alaska.

Illustration: Monatsschr. Kakteenk. **24:** 23, as *Mammillaria wilcoxii*.

Plate XIII, figure 1, as from a photograph of a plant collected at Calabasas, Arizona, by Dr. Rose in 1908 (No. 11955).

129. Neomammillaria mainae (K. Brandegee).

Mammillaria mainae K. Brandegee, Zoe *5:* 31. 1900.

Globose or somewhat depressed, 5 to 8 cm. broad; tubercles pale green, naked in their axils; spines all puberulent, at least when young; radial spines about 10, widely spreading, yellowish or white except the brownish tips; central spines usually stout, yellowish except the strongly hooked tip; flowers from upper part of plant but in old axils, about 2 cm. long, with a broad open throat; outer perianth-segments with a brownish stripe, inner ones with a reddish central stripe with broad nearly white margins; acute inner perianth-segments more or less spreading; stamens purplish; style also purplish, stout, much longer than stamens; stigma-lobes 5 or 6, purplish, elongated, linear; fruit red, globose to obovate, not projecting beyond the tubercles; seeds dull black, obovate, 1 mm. long, punctate, with a narrow basal hilum.

Type locality: South of Nogales, Sonora, Mexico.

Distribution: Northern Sonora.

For a long time it was known only from material collected by Mrs. F. M. Main, near Nogales, Mexico. It has been offered in the trade under the name of *Mammillaria galeottii*, to which, according to Mrs. K. Brandegee, it is not at all related. It was observed by Rose, Standley, and Russell in two localities near Hermosillo, Sonora, Mexico, and living plants were sent to Washington, which flowered in August 1910. This is not very close to any of the other species. It was collected again in Sonora by C. R. Orcutt in 1922.

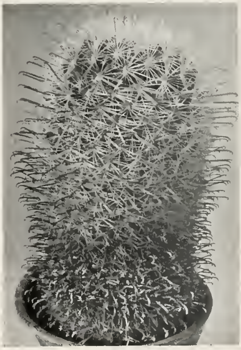


Fig. 172a.—Neomammillaria boedekeriana.

Illustration: Monatsschr. Kakteenk. **22:** 19, as *Mammillaria mainae*.

Figure 172 is from a photograph of a specimen sent by Dr. Trelease from the Missouri Botanical Garden in 1910.

130. Neomammillaria boedekeriana (Quehl).

Mammillaria boedekeriana Quehl, Monatsschr. Kakteenk. *20:* 108. 1910.

Globose to ovoid, but in collections becoming cylindric, dull green; tubercles cylindric; radial spines about 20, white; central spines 3, brownish black, one hooked; axils naked; flowers white with brownish stripes.

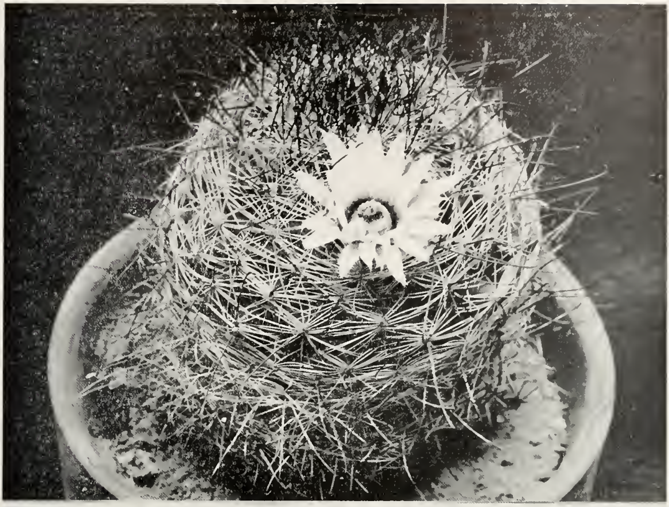
Type locality: Not cited.

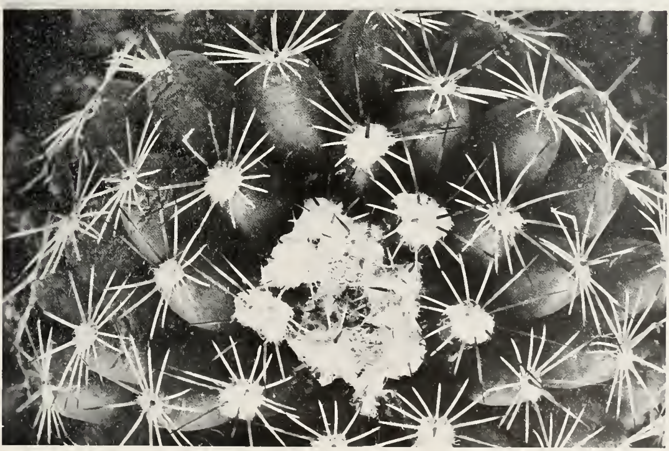
Distribution: Doubtless Mexico, but range unknown.

This plant, which was for a long time in cultivation in Europe, has, according to Mr. Bödeker, entirely disappeared. He writes that it is a prolific bloomer and that once he had a plant with 32 flowers open at the same time. The species is named for Friederich Bödeker of Cologne, Germany. Quehl groups this species next to *Mammillaria wrightii*.

Illustration: Monatsschr. Kakteenk. **20:** 109, as *Mammillaria boedekeriana*.

Figure 172*a* is from a photograph of a plant which had been in cultivation 14 years by Bödeker. The photograph was sent to us in 1923.





Neomammillaria wilcoxii, from Calabasas, Arizona.
Neomammillaria gaumeri, from Yucatan, Mexico.

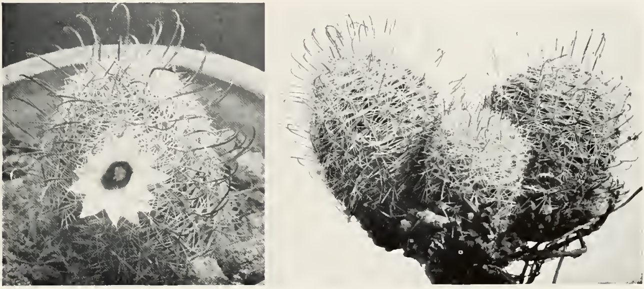
131. Neomammillaria microcarpa (Engelmann).

Mammillaria microcarpa Engelmann in Emory, Mil. Reconn. 157. 1848.
Mammillaria grahamii Engelmann, Proc. Amer. Acad. *3:* 262. 1856.
Cactus grahamii Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Mammillaria grahamii arizonica Quehl, Monatsschr. Kakteenk. *6:* 44. 1896.
Coryphantha grahamii Rydberg, Fl. Rocky Mountains 581. 1917.

Globose to cylindric, simple or budding either at base or near middle, often cespitose, but in small clusters, sometimes 8 cm. high; tubercles small, corky when old; axils of tubercles naked; radial spines 15 to 30, spreading, white, sometimes with dark tips, slender, rigid, glabrous, 6 to 12 mm. long; central spines 1 to 3, dark, when more than one the lower stouter, often 18 mm. long, hooked; flowers from near top of plant, 2 to 2.5 cm. long, broadly funnel-shaped; outer perianth-segments ovate, obtuse, short-ciliate; inner perianth-segments purplish, sometimes with whitish margins, obovate, acuminate; style longer than stamens, purplish; stigma-lobes 7 or 8, linear, green; fruit clavate, 2 to 2.5 cm. long, scarlet; seeds black, shining, pitted, globose, 0.8 to 1 mm. in diameter.

Type locality: "On the Gila, 3,000 to 4,000 feet above the sea."

Distribution: Southwestern Texas and Chihuahua to Arizona and Sonora; recorded from southern California and southern Utah.



Figs. 173 and 174.—Neomammillaria microcarpa.

Neomammillaria microcarpa has long been a favorite in living collections under the name of *Mammillaria grahamii*, but it does not do well in cultivation and soon dies out.

This plant is generally known under the name of *Mammillaria grahamii*. The specific name must now give place to an older one, *microcarpa*. *Mammillaria microcarpa* was based on a drawing made by J. M. Stanly, the artist on W. H. Emory's famous expedition across the continent. This drawing was sent to Dr. George Engelmann by Colonel Emory, early in 1848, with the following note: "November 4, 1846, abundant." From Emory's narrative map of his journey published later, in 1848, we know that on that date his camp was on the eastern side of the Gila and only one day's trip by pack train from the mouth of the San Pedro. His camp was "in a grove of cacti of all kinds; among them being the huge pitahaya [*Carnegiea gigantea*], one of which was 50 feet high." For years we have been striving to have this plant re-collected from the type locality; in 1908 Dr. Rose made an unsuccessful attempt to reach Emory's station.

Finally, at Dr. Rose's request, Mrs. Ruth C. Ross, on June 11, 1922, visited the locality at which Emory's party was camped on November 4, 1846, where he had said that the little *Mammillaria* was abundant. The *Mammillaria* which Mrs. Ross found there, also in some abundance, was the plant which has long passed as *M. grahamii*. Mrs. Ross deserves great credit for the enthusiasm which she has shown in visiting this remote locality and clearing up a botanical puzzle which had remained unsolved for 70 years.*

We have not seen any California or Utah plants and we suspect that the material so-named from those states may belong to the genus *Phellosperma*, which resembles this species in its hooked central spine. The plant is undoubtedly found in northern Mexico, but how far south it extends we are in doubt.

The variety *Mammillaria grahamii californica* has not been described.

Illustrations: Emory, Mil. Reconn. 157. No. 3, as *Mammillaria microcarpa:* Cact. Mex. Bound. pl. 6, f. 1 to 8; Bol. Direccion de Estudios Biol. **2:** f. 2; Rümpler, Sukkulenten 199. f. 112; Schelle, Handb. Kakteenk. 254. f. 176; Remark, Kakteenfreund 16, as *M. grahamii;* Cact. Journ. **1:** 171, as *M. grayhamii.*

Figures 170 and 173 are from photographs of the plants collected by Dr. Rose from the northern end of the Tucson Mountains, Arizona, April 22, 1908; figure 174 is from a photograph of a plant collected by Mrs. Ross at the type locality.

CACTUS ESCHANZIERI Coulter, Contr. U. S. Nat. Herb. **3:** 104. 1894.

"Depressed-globose, 3 cm. in diameter, simple; tubercles broader at base, 6 to 8 mm. long, with naked axils; spines all pubescent; radials 15 to 20, with dusky tips, the lateral 10 to 12 mm. long, the lower weaker, shorter, and curved, the upper shorter; solitary central spines reddish slender, somewhat twisted, usually hooked upwards, 15 to 25 mm. long; flowers red (?); fruit reddish (?), ovate, about 10 mm. long; seeds reddish, oblique-obovate, 1.2 mm. long, pitted, with subventral hilum."

It is stated at the original place of publication that the type collected by Eschanzier in 1901 was in the herbarium of Coulter, but it can not be found and is probably lost. Coulter says that it resembles *Cactus grahamii*, but judging from the description and its habitat it is not very near that species. It is evidently a *Neomammillaria*, possibly referable to one of the many species which have been described from San Luis Potosí.

132. **Neomammillaria milleri** sp. nov.

Globose to elongated cylindric, sometimes more than 2 dm. long and up to 8 cm. in diameter; tubercles closely set, rather thick, nearly 1 cm. long, the axils not bristly and seemingly always naked; radial spines about 20, widely spreading, 12 mm. long or less, white, with brownish tips; central spines 2 to 4, one or all hooked at apex, brown, about 2 mm. long; flowers campanulate, about 2 cm. long, the limb 2.5 cm. broad, purple to nearly pink; inner perianth-segments similar to the outer, oblong, the margins a little paler and somewhat undulate, the apex usually obtuse, often rounded, rarely acute; stamens pale purple; style white; stigma-lobes 7 to 9, linear, yellowish to cream-colored; fruit clavate, scarlet, 1.5 cm. long; seeds black.

Collected by Dr. Gerrit S. Miller jr., near Phoenix in 1921, and by Mrs. Bly near Kingman, June 29, 1921, and in 1922. It has been observed by C. R. Orcutt near Phoenix (No. 559*a*, type) and near Wickenburg (No. 559,) during the summer of 1922 and several fine specimens were sent in by him. He states that it has long been known as "*Mammillaria grahamii* var." and that it suggested at times *M. phellosperma*, *M. goodridgei*, and *M. grahamii.* It differs, however, from the first in its seeds, from the second in its naked axils, and from the last in its stouter habit and stronger central spines.

Figure 184*a* is from a photograph of the type, collected by Mr. Orcutt.

133. **Neomammillaria sheldonii** sp. nov.

Stems slender-cylindric, about 8 cm. high; axils of tubercles without setae; radial spines 12 to 15, pale with dark tips, the 3 or 4 upper ones darker, a little stouter and 1 or 2 of them subcentral, the true central erect or porrect, with upturned hook at end; outer perianth-segments ciliate; inner perianth-segments about 10, broad, acute, light purple with very pale margins; filaments and style light purple; stigma-lobes 6, green; fruit clavate, 2.5 to 3 cm. long, pale scarlet.

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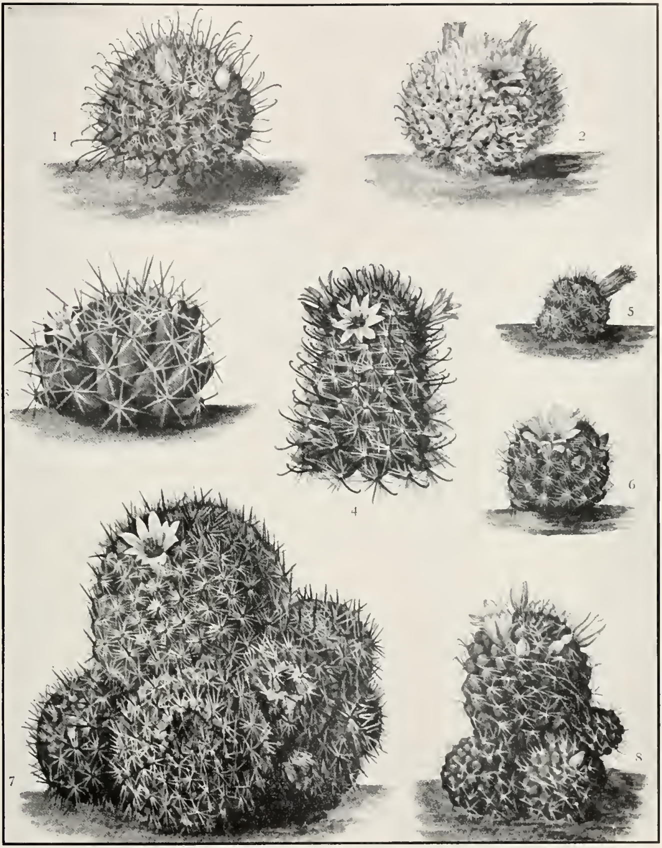
* Mrs. Ross's label bears this note: On upper terrace on right bank of Gila River in s. e. corner, section 15, t. 4 s. R. 16 E. (Christmas Triangle). From grove of cactus in which we believe Emory camped, Nov. 4, 1846.



1. Flowering plant of *Neomammillaria kunzeana.*
2. Flowering plant of *Neomammillaria bocasana.*
3. Flowering plant of *Neomammillaria decipens.*
4. Top of flowering plant of *Neomammillaria armillata.*
5. Flowering plant of *Neomammillaria multiceps.*
6. Flowering plant of *Neomammillaria multiceps.*
7. Flowering plant of *Neomammillaria palmeri.*
8. Flowering plant of *Neomammillaria wildii.*

This plant is described chiefly from the specimens collected by Rose, Standley, and Russell, near Hermosillo, Sonora, Mexico (No. 12366, type), but it has also been collected in Sonora by C. R. Orcutt and by Charles Sheldon, for whom it is named.

The plant differs from the *Neomammillaria microcarpa* in its stouter redder spines, in its heavier and shorter central spine with the hook more uniformly turned upward, and in its flowers, which appear to be smaller.

Figure 175 shows a plant collected by Rose, Standley, and Russell, in Hermosillo in 1910 (No. 12366), which flowered in Washington.

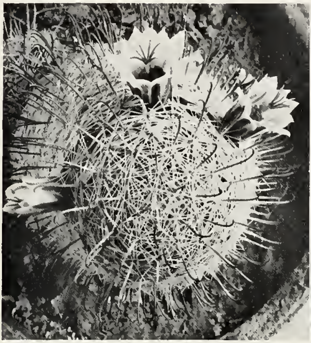


FIG. 175.—Neomammillaria sheldonii.

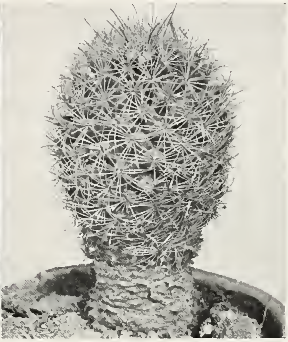


FIG. 176.—Neomammillaria carretii.

134. **Neomammillaria armillata** (K. Brandegee).

Mammillaris armillata K. Brandegee, Zoe 5: 7. 1900.

In clusters of 3 to 12, cylindric, sometimes 30 cm. high; tubercles bluish green, somewhat angled; axils setose and slightly woolly; radial spines 9 to 15, 7 to 12 mm. long, yellowish; central spines 1 to 4, but usually 2, brownish, the lowest one hooked and a little longer than the others; flowers 10 to 12 mm. long, greenish to flesh-colored; stigma-lobes greenish, short; fruit red, clavate, 15 to 30 mm. long; seeds black, punctate, constricted just above the base.

Type locality: San José del Cabo.

Distribution: Southern Lower California and on islands adjacent to it.

This species is very common in southern Lower California near the coast. Dr. Rose in 1911 collected it both at the type locality (No. 16455), and at Cape San Lucas (No. 16374). Similar to this is his plant (No. 16877) from Cerralbo Island off the coast of Lower California.

Illustration: Grässner, Haupt-Verz. Kakteen 1914: 23, as *Mammillaria armillata.*

Plate XIV, figure 4, shows the top of a plant collected by Dr. Rose on Margarita Island, Lower California, in 1911 (No. 16302); plate XV, figure 2, shows a plant collected by Dr. Rose on Santa Maria Bay (No. 16276); figure 3 shows the top of a plant collected by Dr. Rose at San Esteban, Lower California; figure 4 shows another plant from the same island.

135. **Neomammillaria fraileana** sp. nov.

Stems elongated, cylindric, 1 to 1.5 dm. long; axils of tubercles naked or containing at most a single bristle; central spines dark brown, one of them strongly hooked; flowers rather large, pinkish; inner perianth-segments acuminate, 2 to 2.5 cm. long, often lacerate towards the tip; filaments and style pinkish, the latter paler and much longer than the stamens; stigma-lobes 6, long and slender, rose-colored.

Collected by Dr. J. N. Rose on Pichilinque Island, March 27, 1911 (No. 16508, type); on Cerralbo Island, April 19, 1911 (No. 16895); and on Catalina Island, April 16, 1911 (No. 16831).

136. **Neomammillaria swinglei** sp. nov.

Stems cylindric, 1 to 2 dm. long, 3 to 5 cm. in diameter; axils of tubercles more or less setose; radial spines rather stout for this group, spreading, dull white with dark tips; central spines 4, ascending, dark brown or black, the lowest one elongated (1 to 1.5 cm. long), hooked at apex or sometimes straight; outer perianth-segments greenish or sometimes pinkish; margins somewhat scarious; inner perianth-segments narrowly oblong, nearly white with a brown stripe down center; style pink, twice as long as the pink filaments; stigma-lobes 8, linear, pointed, green; fruit dark red, clavate, 14 to 18 mm. long; seeds 1 mm. in diameter, constricted below, black with a large elliptic basal hilum.

Common about Guaymas, Sonora; flowers and stems described from Rose's plant (No. 12568, type) and Johnston's plant (No. 3086), and the fruit and seeds from one collected by Swingle; also collected by Dr. W. S. W. Kew in 1920.

In cultivation the inodorous flowers remain open for several days (at least three).

Growing with this species (see Rose, No. 12569) were plants with all the central spines straight. This may be the plant from Guaymas which Scheer called "a very robust species of *Mammillaria sphaerica*."* Neither flowers nor fruit were seen.

137. **Neomammillaria dioica** (K. Brandegee).

Mammillaria dioica K. Brandegee, Erythea *5:* 115. 1897.
Mammillaria fordii Orcutt, West Amer. Sci. *13:* 49. 1902.

Either solitary or clustered, cylindric, 5 to 25 cm. high or even higher; † axils of tubercles woolly and short-setose; radial spines 11 to 22, white, the tips often brownish to black or rose-colored throughout, 5 to 7 mm. long, spreading; central spines 3 or 4, brownish, the lower one a little longer than the others and hooked; flowers borne towards top of plant, yellowish white with purplish mid-rib, 10 to 22 mm. long, incompletely dioecious; outer and inner perianth-segments usually 6 each; outer perianth-segments reddish, especially along mid-rib, the inner ones oblong, pale cream-colored, notched or toothed near apex; style white; stigma-lobes 6, linear, bright yellow to brownish green; fruit scarlet, clavate, 10 to 25 mm. long; seeds black.

Type locality: West coast of Lower California.

Distribution: Southwestern California and northwestern Lower California. According to Mr. Orcutt, this plant extends east of the coastal mountains on the border of Imperial and San Diego Counties.

Although we have not seen the type of *Mammillaria fordii* we have referred it here on the advice of Mr. Orcutt, the author of this species.

Illustrations: Cact. Mex. Bound. pl. 8, f. 9 to 14, as *Mammillaria goodridgii.*

138. **Neomammillaria goodridgei** (Scheer).

Mammillaria goodridgei ‡ Scheer in Salm-Dyck, Cact. Hort. Dyck. 1849. 91. 1850.
Mammillaria goodridgii Scheer in Seemann, Bot. Herald 286. 1856.
Cactus goodridgii Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

Stems clustered, erect, globose to cylindric, up to 10 cm. long, 3 to 4 cm. in diameter; axils of tubercles not setose; radial spines 12 to 15, spreading, white, sometimes with dark tips; central spines usually

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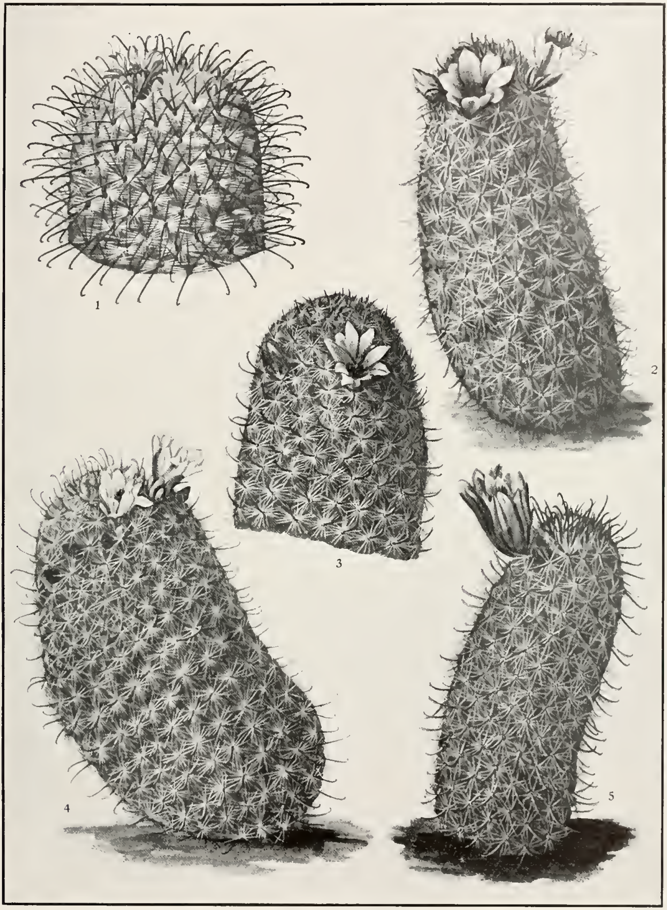
* Bot. Herald 286.

† In February 1922, Mr. C. R. Orcutt sent us a single plant from the Mason's Valley on the eastern side of the Coast Mountains in San Diego County, California, which was the largest solitary one we had ever seen, being more than 33 cm. long, 10 cm. in diameter, and weighed 3 lbs. 13 oz. Three small buds were produced near the middle of the plant.

‡ Given as *Mammillaria goodrichii,* in error.



1. Flowering plant of *Neomammillaria bombycina.*
2. Flowering plant of *Neomammillaria armillata.*
3. Top of flowering plant of *Neomammillaria armillata.*
4. Flowering plant of *Neomammillaria armillata.*
5. Flowering plant of *Neomammillaria goodridgei.*

(All three-fourths size.)

1, white below, brown above, hooked; flowers perfect, rose-colored, 15 mm. long; segments oblong, obtuse or retuse; fruit clavate, 1.5 to 2 cm. long, scarlet, naked; seeds black, punctate, with a narrow basal hilum.

Type locality: Cedros Island, off Lower California.

Distribution: Cedro Island and the adjacent mainland of Lower California.

This species was originally collected on Cedros Island, by Mr. J. Goodridge, surgeon on the *Herald* during its memorable trip to the western coast of the Americas. The plant, which was sent to Scheer and named by him, was sent to Prince Salm-Dyck, who described it without knowing the flowers or fruit. The name has been associated with *N. dioica.*

Several collectors have visited Cedros Isalnd, but all failed to find *Mammillaria goodridgei* until Dr. Rose collected it in 1911 (No. 16171); he also found it on the nearby mainland at Abreojos Point (No. 16248). Recently a plant was sent in from near Mulegé by B. F. Hake.

Plate xv, figure 5, shows a plant collected by Dr. Rose at Mulegé, Lower California in 1911, which flowered in the New York Botanical Garden, April 11, 1912.

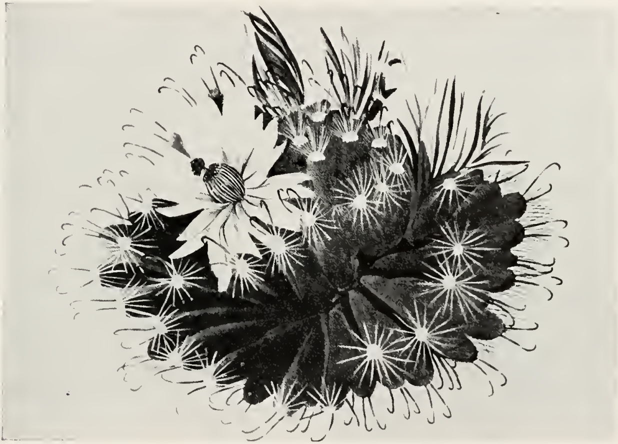


Fig. 177.—Neomammillaria zephyranthoides.

139. Neomammillaria zephyranthoides (Scheidweiler).

Mammillaria zephyranthoides Scheidweiler, Allg. Gartenz. *9:* 41. 1841.
Mammillaria fennelii Hopffer, Allg. Gartenz. *11:* 3. 1843.
Cactus zephyranthodes Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Depressed-globose to short-cylindric, up to 8 cm. high, 10 cm. in diameter; tubercles about 2 cm. long; radial spines 14 to 18, 8 to 10 mm. long, very slender, white; central spines 1 (sometimes 2), larger than the radials and hooked, at first purple, but in age yellowish at base; flowers 3 to 4 cm. broad with rotate limb; perianth-segments white with red stripes; fruit and seeds unknown.

Type locality: Oaxaca, altitude about 2,300 meters.

Distribution: Oaxaca, Mexico.

We have followed previous authors in referring here *Mammillaria fennelii* and Pfeiffer's illustration, based on his statement that the type plant was abnormal and much smaller than the one figured and with smaller tubercles.

The plant was in flower at Erfurt, Germany, where Dr. Rose studied it in 1912.

Illustrations: Pfeiffer, Abbild, Beschr. Cact. **2:** pl. 8, as *Mammillaria zephyranthiflora;* Schelle, Handb. Kakteenk. 254. f. 175, as *Mammillaria zephyranthoides.*

Figure 177 is reproduced from the first illustration cited above.

140. Neomammillaria carretii (Rebut).

Mammillaria carretii Rebut in Schumann, Gesamtb. Kakteen 542. 1898.

Solitary, dull green, globose, depressed, small, 5 to 6 cm. in diameter; tubercles cylindric; axils of tubercles naked; radial spines 14, subulate, spreading, recurved, nearly clothing the plant, long, yellowish; central spine 1, slender, chestnut-brown, hooked; flowers 2.5 cm. long; inner perianth-segments white, streaked with rose; fruit and seeds unknown.

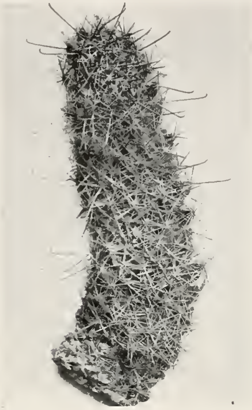


FIG. 178.—Neomammillaria bombycina.

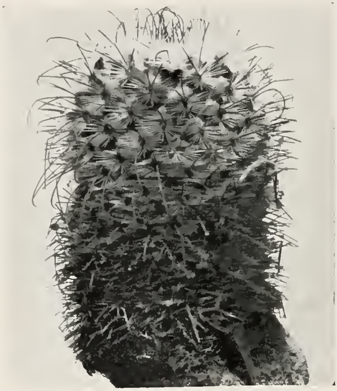


FIG. 179. Neomammillaria occidentalis.

Type locality: Not cited.

Distribution: Doubtless Mexico, but no definite locality known.

We have not seen this species and know it only from descriptions and illustrations.

It is related to *Neomammillaria saffordii* but radial spines are yellow, flowers white with a streak of rose, and probably larger throughout.

Illustrations: Grässner, Haupt-Verz. Kakteen **1912:** 18; **1914:** 24, as *Mammillaria carretii.*

Figure 176 is reproduced from a photograph sent us by L. Quehl in 1921.

141. Neomammillaria jaliscana sp. nov.

Cespitose, globose, 5 cm. in diameter, bright green; tubercles in 13 rows, 4 to 5 mm. high; radial spines 30 or more, at right angles to the tubercles; central spines 4 to 6, reddish brown, darker toward the tips, one of them strongly hooked; axils naked; flowers pinkish to purplish, delicately fragrant, 1 cm. broad when fully expanded; outer segments ovate-oblong, acute or obtuse with a more or less serrulate margin; inner perianth-segments oblong, obtuse; filaments pinkish; stigma-lobes 3 or 4, white; fruit white, 8 mm. long; seeds black.

Collected by J. N. Rose at Río Blanco, near Guadalajara, Mexico, in September 1903 (No. 858, type), by C. R. Orcutt near Guadalajara and by B. P. Reko from the same locality in 1922 (No. 4410).

Dr. Rose introduced this species into cultivation but his plants all died. It flowered with us in March 1904 and again in 1923.

142. Neomammillaria bombycina (Quehl).

Mammillaria bombycina Quehl, Monatsschr. Kakteenk. *20:* 149. 1910.

Cylindric, 15 to 20 cm. long, 5 to 6 cm. in diameter; tubercles spiraled, obtuse; young areoles conspicuously white-woolly; radial spines numerous, acicular, widely spreading, short, 1 cm. long or less; central spines 4, elongated, a little spreading, those toward the top of plant erect, 2 cm. long, brown except at base, the lower one hooked; flowers from near top, light purple, about 1 cm. long; perianth-segments narrowly oblong; filaments and style pinkish; stigma-lobes 4, purplish.

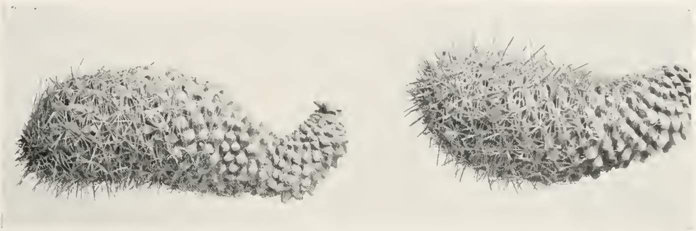


FIG. 179*a*.—Neomammillaria occidentalis.

Type locality: Mexico.

Distribution: Mexico, but range unknown.

We have had this plant in cultivation for a number of years. It is a very attractive plant, the top being covered by a mass of white hairs which come from the closely set young tubercles.

Mammillaria cordigera Heese resembles this species very much in its spines and form, but is described as with grooved tubercles, which would exclude it from this genus (see page 50).

Illustration: Monatsschr. Kakteenk. **20:** 151, as *Mammillaria bombycina.*

Plate XV, figure 1, shows a plant received by Dr. Rose from M. de Laet in 1910 and probably from the type collection. Figure 178 is from a photograph of another plant from the same collection.

143. Neomammillaria occidentalis sp. nov.

Cespitose, the branches slender, cylindric, 10 cm. high, densely spiny; radial spines about 12, yellowish, spreading; central spines 4 or 5, reddish or brown, one of them longer and hooked; flowers small, 1 cm. long, pink; stigma-lobes 9, slender; fruit said to be red.

Collected by Dr. E. Palmer near Manzanillo, Colima, Mexico, December 1890 (No. 1053, type) and again from the same locality by Stephen E. Aguirre, American Vice-Consul-in-Charge, October 1922. Dr. Palmer's field notes say:

"A cactus quite plentiful among rocks in exposed places. Three flowers of a pink color and three red fruits were collected. The specimens of the plants collected were cut off close to the ground; they are a fair sample of plants of the average height and diameter, but in drying they shrink to three-fourths their original dimensions."

Figure 179 is from a photograph of a plant from the type collection; figure 179*a* is from a photograph of the plants referred to above, sent by Mr. Aguirre.

144. Neomammillaria fasciculata (Engelmann).

Mammillaria fasciculata Engelmann in Emory, Mil. Reconn. 157. 1848.
Cactus fasciculatus Kuntze, Rev. Gen. Pl. *1:* 259. 1891.
Mammillaria thornberi Orcutt, West Amer. Sci. *12:* 161. 1902.

Forming clumps, often containing many plants (as many as 110 have been noted), slender-cylindric, usually 5 to 8 cm., but sometimes 30 cm. high; axils of tubercles naked; radial spines 13 to 20, slender, 5 to 7 mm. long, white, with dark brown or nearly black tips; central spine usually 1, sometimes 2 or 3, often much elongated and 18 mm. long, brownish or black, one (sometimes all) strongly hooked; flowers broadly funnel-shaped, purplish; inner perianth-segments broad, acute, fruit short-clavate, scarlet, 8 mm. long; seeds black.

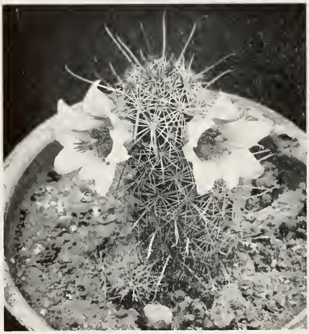


Fig. 180.—Neomammillaria fasciculata.

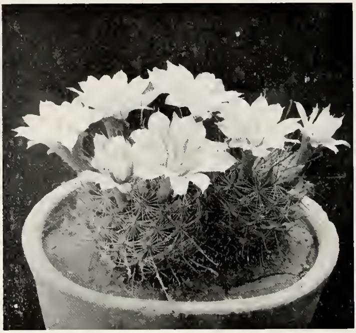


Fig. 181.—Neomammillaria longiflora.

Type locality: Along the Gila River.

Distribution: Southern Arizona.

This plant was found by Emory, October 20, 1846, on the Gila River, 3,000 or 4,000 feet above the sea, and was afterwards described by Engelmann from the sketch made in the field; for more than 50 years afterwards the plant remained otherwise unknown. About 1902 it was rediscovered by Professor Thornber and Mr. Orcutt near Tucson. On this latter collection Mr. Orcutt based *Mammillaria thornberi,* but he afterwards referred it to *M. fasciculata;* he is now inclined to question this reduction and thinks that *M. fasciculata* may be a species of *Echinocereus.* Engelmann, however, pointed out, when he described this species, that the spines were not arranged in vertical ribs as in *Echinocereus.* While we have not been able to prove beyond doubt the identity of the two names, as there is only one plant of this habit known from southeastern Arizona, we have admitted only one species and have used for it the older name; if a second species is afterwards found it may then be necessary to revise our conclusions. The plant has been collected several times since 1902 but it is still rare.

Illustration: Emory, Mil. Reconn. 157. f. 2, as *Mammillaria fasciculata.*

Figure 180 is from a photograph of a plant collected by F. E. Lloyd near Tucson in 1906.

145. **Neomammillaria nelsonii** sp. nov.

Globose, 5 cm. in diameter; tubercles numerous, small, terete, apparently not milky, 5 to 7 mm. long, their axils naked; radial spines about 15, acicular, white, 6 to 8 mm. long, spreading; central spines several, all like the radials; but one of them elongated, stouter and longer than the others, brown to black, strongly hooked, 12 to 15 mm. long; flowers unknown; fruit very slender, clavate, 3 cm. long or more, red, few-seeded; seeds globose, black, rugose, 2 mm. in diameter; hilum basal, triangular, white, depressed.

Collected by E. W. Nelson on cliffs at La Salada, Michoacán, Mexico, March 23, 1903 (No. 6932).

This plant in its form and in the color and shape of the fruit agrees with *Neomammillaria* but differs from all the species we know in its rather large rugose black seeds. It somewhat resembles *Neomammillaria zephyranthoides.*

Figure 182 shows the fruit, spine-cluster, and seed of the type.

146. **Neomammillaria longiflora** sp. nov.

Solitary or clustered, small, 3 cm. in diameter, apparently not at all milky; tubercles small, terete, not grooved on upper side, 5 to 7 mm. long, rather closely set and nearly hidden by the spines; radial spines about 30, acicular, 10 to 13 mm. long, yellow or straw-colored, somewhat spreading; central spines 4, reddish brown, much stouter than the radials, 3 of them straight, about length of radials, 1 of them hooked at apex, twice as long as others; flowers several, even on small plants, borne near top, 2 cm. long or more, with a distinct narrow tube; perianth-segments pinkish, oblong, acute; ovary very small, ovoid, more or less sunken in the axils, thin above and perhaps opening by an operculum, the lower part with the seeds persisting for years; seeds nearly globose, minutely pitted, 1 to 1.5 mm. in diameter, black with a prominent white hilum.

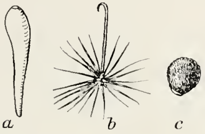


Fig. 182.—Fruit, spine-cluster, and seed of N. nelsonii.

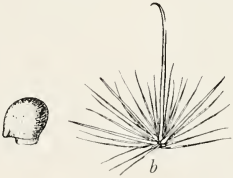


Fig. 183.—Seed and spine-cluster of N. longiflora.

Collected at Santiago Papasquiaro, Durango, by Dr. Edward Palmer in 1897 (No. 89),

We have repeatedly studied this curious plant during the last 25 years, but have never been able to identify it or reach a definite conclusion as to its relationship. Our material consists of a single plant split down one side, bearing several withered flowers, and two detached flowers. Recently, we were sent a photograph of a cactus from Mexico, labeled *Mammillaria* n. sp., Sierra de Cacaria S. de Ulama, which seemed to be Dr. Palmer's plant and led us to make a detailed study of it. One of the peculiarities was the absence of an exserted ovary, so conspicuous in all the *Neomammillaria.* The cut stem showed an exposed sunken ovary, and by mere chance an old fruit with ripe seeds, probably several years old, was found in the axils of one of the oldest tubercles. As described above, the seeds are very unlike those of any species of *Neomammillaria.*

Figure 181 is a reproduction of the photograph mentioned above; figure 183 shows the seed and spine-cluster of the type.

147. Neomammillaria tacubayensis (Fedde).

Mammillaria tacubayensis Fedde, Nov. Gen. Sp. Ind. 1905. 443. 1905.

Globose, 3 to 5 cm. in diameter; radial spines 35 to 40, white, 3 to 5 mm. long; central spines 1, black, 5 to 6 mm. long, hooked; flower 1.5 cm. long.

Type locality: Near Tacubaya, Mexico.

Distribution: Mexico, but range unknown.

We know the plant only from the original description and illustration.

Illustration: Gartenflora **53:** 214, f. 33, as *Mammillaria* stella de Tacubaya (but legend placed under figure 32).

148. Neomammillaria umbrina (Ehrenberg).

Mammillaria umbrina Ehrenberg, Allg. Gartenz. *17:* 287. 1849.
Cactus umbrinus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Simple or becoming cespitose, cylindric, 10 to 12.5 cm. high, dull green; tubercles conic; axils of tubercles naked; radial spines 22 to 25, spreading, white, 4 to 6 mm. long; central spines 4, 3 being 8 to 10 mm. long, one being 20 to 24 mm. long, hooked; flowers large, 2 cm. long; inner perianth-segments about 15, narrowly lanceolate, acute, purple; stamens numerous, described as connivent, white; style filiform, longer than the stamens; stigma-lobes 7, green.

Type locality: Mexico.

Distribution: Hidalgo, according to Schumann.

We know this species from description only; it is peculiar in having hooked spines and large flowers; it resembles somewhat *Neomammillaria zephyranthoides* but is undoubtedly distinct.

149. Neomammillaria verhaertiana (Bödeker).

Mammillaria verhaertiana Bödeker, Monatsschr. Kakteenk. *22:* 152. 1912.

Solitary, short-cylindric; tubercles subconic, their axils setose; radial spines 20 or more, yellowish, setaceous, 1 cm. long, glabrous; central spines 4 to 8, stouter than the radials, brown at tip, one of them hooked at apex; flowers white, 2 cm. long, appearing in a circle below top of plant; outer perianth-segments broadly lanceolate, yellowish white; anthers rose-colored; style rose; stigma-lobes 8 or 9.

Type locality: Mexico.

Distribution: Known only from the type locality.

We know the plant only from descriptions and illustrations and a few spine-clusters sent us by L. Quehl. Bödeker placed it next to *Mammillaria spinosissima*, but unlike that species one of the central spines is hooked.

The species is named for François Verhaert.

Illustration: Monatsschr. Kakteenk. **22:** 153, as *Mammillaria verhaertiana.*

150. Neomammillaria xanthina sp. nov.

Depressed-globose, 7 cm. high, 8 to 9 cm. broad, dull bluish green; axils of tubercles and spine-areoles densely white-woolly when young, glabrate in age; tubercles lactiferous, broader than high, the free part about 5 mm. long, somewhat flattened dorsally, arranged in 34 spiral rows;

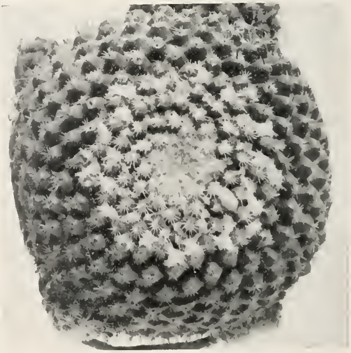


FIG. 184.—Neomammillaria xanthina.

spine-areole circular, small; radial spines 10 to 12, spreading, acicular, white, 4 mm. long or less; central spines 2, stouter, but not much longer than the radials, somewhat brownish, more or less erect; flowers from the top of the plant but in the axils of old tubercles, the tube not exserted and the limb appressed against the adjacent tubercles; perianth rotate, 16 mm. broad, its segments, stamens, and style pale lemon-yellow; outer perianth-segments oblong, obtuse with ciliate margins, the inner a little longer than the outer, usually entire, oblong, usually retuse at apex, sometimes apiculate.

Sent by B. P. Reko (No. 4401) but collected by A. Groeschner from the vicinity of Monte Mercado, Durango, Mexico, in 1922 and flowered in Washington in May 1923.

Figure 184 is from a photograph of the type specimen.

LITTLE-KNOWN SPECIES PROBABLY OF THIS GENUS.

MAMMILLARIA ALPINA Martius in Salm-Dyck, Cact. Hort. Dyck. 1849. 79. 1850.

Cactus alpinus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

This plant has not been identified. Its large flowers, 2.5 cm. broad, suggest a species of *Coryphantha*. It was collected by Karwinsky in the state of Oaxaca.

MAMMILLARIA BELLATULA Förster, Allg. Gartenz. **15:** 51. 1847.

Cactus bellatulus Kuntze, Rev. Gen. Pl. *1:* 259. 1891.

Spherical, somewhat compressed, bright green; tubercles broadly cone-shaped, 4 mm. long, their axils naked; spine-areoles white-woolly when young; radial spines 12 to 16, whitish, bristle-like, spreading, 6 to 8 mm. long; central spines 2, straight, one pointing downward, the other upward, 12 to 16 mm. long, at first almost black, grayish brown in age; flowers and fruit unknown.

This species is said to have been grown from Brazilian seed; if this were true it would exclude it from this genus and for this reason Schumann questioned whether it might not be an *Echinocactus*. Judging from the description we believe that it is closely related to *Neomammillaria elegans* and is probably of Mexican origin.

MAMMILLARIA BERGII Miquel, Comment. Phytogr. 104. 1840.

Simple, subglobose, glaucous green; tubercles somewhat 4-angled at base, nearly terete above, woolly in the axils; spine-areoles woolly when young, becoming naked; spines 4, spreading, the uppermost one largest.

This plant is from Mexico.

MAMMILLARIA CAESPITITIA De Candolle, Mém. Mus. Hist. Nat. Paris **17:** 112. 1828.

Mammillaria nitida Scheidweiler, Allg. Gartenz. *9:* 42. 1841.
Cactus caespititius Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

Densely cespitose, the clump 10 cm. in diameter; joints globose, 2.5 cm. in diameter; tubercles small, ovate; spines straight, rigid, when young whitish yellow, in age gray; radial spines 9 or 10; central spines 1 or 2, longer than the radials, erect; flowers and fruit unknown.

Both Pfeiffer and Schumann overlooked this species and it is doubtful if it can ever be identified. The plant was collected by Thomas Coulter in Mexico.

MAMMILLARIA CONICA Haworth, Suppl. Pl. Succ. 71. 1819.

Tubercles large, conic; spines less than 10, all radial, red but paler at base; flowers and fruit unknown.

Neither Pfeiffer nor Schumann knew this species or its origin. The Index Kewensis refers it to South America. If from that region it must be a species of *Discocactus*, near *D. placentiformis*.

MAMMILLARIA DIACENTRA Jacobi, Allg. Gartenz. 24: 91. 1856.

Globose, about 7 cm. in diameter; tubercles milky, rhomboid at base, not setose in their axils; radial spines 5 or 6, white, with blackish tips; central spines 2, stouter and longer than the radials, grayish, with blackish tips, the lower central 2.5 cm. long or more; flowers small, reddish; style rose-colored; stigma-lobes 6.

This species was unknown to Schumann, and we are unable to group it; its origin is not recorded.

MAMMILLARIA FLAVESCENS Haworth, Suppl. Pl. Succ. 71. 1819.

Cactus mammillaris lanuginosus De Candolle, Pl. Succ. 111. 1799.
Cactus flavescens De Candolle, Cat. Hort. Monosp. 83. 1813.
Mammillaria straminea Haworth, Suppl. Pl. Succ. 71. 1819.
Cactus stramineus Sprengel, Syst. *2:* 494. 1825, as to name.
Mammillaria simplex flavescens Schumann, Gesamtb. Kakteen 573. 1898.

This plant was first described in 1799 by De Candolle as "var. *B*" of *Cactus mammillaris* or *Cactus mammillaris lanuginosus* (Pl. Succ. pl. 111); at this time he referred to it certain citations of Plumier and Hermann which we now know belong to *Neomammillaria prolifer* and *N. mammillaris* respectively. This variety was raised to specific rank by De Candolle in 1813 as *Cactus flavescens* (Cact. Hort. Monosp. 83). From the more detailed description then given it is clear that *Cactus flavescens* can not be referred to either *N. prolifera* or *N. mammillaris.* It was transferred to the genus *Mammillaria* by Haworth in 1819, but he added little information except the statement that it had been in cultivation in the Chelsea Garden before 1811.

The question has been raised whether this plant is really West Indian. It is true that De Candolle does not state its origin, but it would be indicated that he believed that it was West Indian by his treating it as a variety of the common West Indian species and by his referring to it several West Indian descriptions when he later published it as a species. Pfeiffer states that it is tropical American. As *Neomammillaria mammillaris* is the only species known from South America it could not have come from that continent, and at that time no *Mammillaria* had been discovered in the United States or Mexico. Förster in 1846 says that it is West Indian, and this was Schumann's conclusion.

MAMMILLARIA FLAVICOMA Hortus in Förster, Handb. Cact. ed. 2. 298. 1885.

This species was described from garden plants of unknown origin. Schumann does not mention it in his monograph and it has remained unknown.

MAMMILLARIA GRISEA Salm-Dyck, Cact. Hort. Dyck. 1849. 110. 1850.

Cactus griseus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

Stout, short-cylindric, 10 to 12.5 cm. high, 7.5 cm. in diameter; tubercles glaucous-green, somewhat 4-angled, their axils woolly and setose; radial spines 10 to 12, spreading, short, rigid, white; central spines 4 to 6, white, with brown or blackish tips, on greenhouse plants 10 to 15 mm. long, but on wild plants 5 cm. long or more; flower and fruit unknown.

This is perhaps different from *Mammillaria grisea* Galeotti (Förster, Handb. Cact. 219. 1846), which was never described.

MAMMILLARIA HEINEI Ehrenberg, Bot. Zeit. 2: 833. 1844.

Cactus heinei Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

Schumann thought that this name was referable to *Mammillaria umbrina* but we have not been able to satisfy ourselves that the two are the same.

Much confusion is found in the spelling of the name; it sometimes appears as *M. haynii* and *M. haynei.* Salm-Dyck transfers two species of Ehrenberg to varieties of *M. haynii* but both are unknown to us. These varieties are as follows: var. *viridula* Salm-Dyck (Cact. Hort. Dyck. 1849. 10. 1850; *M. viridula* Ehrenberg, Allg. Gartenz. 16: 267. 1848), and var. *mini-*

ma Salm-Dyck (Cact. Hort. Dyck 1849. 10. 1850; *M. digitalis* Ehrenberg, Allg. Gartenz. **16**: 267. 1848).

MAMMILLARIA HELICTERES De Candolle, Mém. Mus. Hist. Nat. Paris **17**: 31. pl. 5. 1828.

This name was based on Mociño and Sessé's drawing of a Mexican plant, which has never since been definitely identified. It was called by them *Cactus helicteres* (De Candolle, Prodr. **3**: 460. 1828), but it was renamed *Mammillaria convoluta* by St. Lager (Ann. Soc. Bot. Lyon **7**: 130. 1880). The published drawing indicates that the plant is of this genus.

MAMMILLARIA HEXACANTHA Salm-Dyck, Hort. Dyck. 344. 1834.

Cactus hexacanthus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

Solitary, short-cylindric; tubercles somewhat compressed, light green; areoles ovate to oblong when young ,white-tomentose, glabrate in age; radial spines 25 to 30, white, 4 mm. long; central spines 6, stouter than the radials, brown, the 4 lateral ones 8 mm. long, the uppermost ones a little longer, the lowermost ones 18 mm. long, somewhat deflexed; flowers and fruit unknown.

This plant, which is of Mexican origin, is unknown to us except from description; Schumann referred it to *Mammillaria coronaria*, but it has nothing to do with that plant.

MAMMILLARIA IRREGULARIS De Candolle, Mém. Mus. Hist. Nat. Paris **17**: 111. 1828.

Cactus irregularis Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

Cespitose, 5 cm. high, with a subtuberous base; joints ovoid, 2.5 cm. in diameter; spines all radial, 20 to 25, spreading or somewhat reflexed; flowers and fruit unknown.

This plant was collected by T. Coulter (No. 31). It has never been re-identified. It was grown at the Botanical Garden at Geneva, Switzerland, at the time the description was published but, unfortunately, no specimens were preserved; other types based on Coulter's plants are similarly lost and can never be certainly identified.

MAMMILLARIA JOOSSENSIANA Quehl, Monatsschr. Kakteenk. **18**: 95. 1908.

Simple, globose to cylindric, up to 5 cm. high, 3 cm. in diameter, pale green, slightly depressed at apex; young areoles white-woolly; radial spines 20, slender-subulate, straight, white, 12 mm. long; central spines 4, stouter than the radials, 15 mm. long or more, one of them often hooked; flowers small, yellow.

We know this plant, which is a native of Mexico, only from description and two small plants sent us by Frantz de Laet in 1922. Quehl places it in Schumann's classification just after *M. amoena*, although one of the central spines is hooked.

MAMMILLARIA LESAUNIERI Rebut in Schumann, Gesamtb. Kakteen 533. 1898.

Simple, globose, or a little longer than broad; tubercles conic, their axils naked; radial spines 11 to 13, slender, subulate, straight, white, 6 to 8 mm. long; central spines solitary, very short (5 mm. long or less), brownish, erect; flowers reddish, 2.5 cm. long.

Type locality: Described from cultivated plants.

Distribution: Supposed to be Mexico proper or Lower California.

This species is supposed to have the habit of *Mammillaria heyderi*.

Here probably belongs *Mammillaria lassonneriei* Rebut (Monatsschr. Kakteenk. 7: 29. 1897), a garden name of which we have found no accompanying description. The dealer, Grässner, in his Catalogue of Cacti for 1912 (p. 21) and 1914 (p. 33) has illustrated *M. lassaunieri*.

MAMMILLARIA LEUCOCENTRA Berg, Allg. Gartenz. **8**: 130. 1840.

Cactus leucocentrus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

Ovoid, about 10 cm. high; tubercles ovoid, their axils very white-woolly; young spine-areoles white-tomentose at first, becoming naked; radial spines spreading, numerous, setose, white; central spines 4 to 6, stouter and longer than the radials, white throughout or with black.

Recorded from Oaxaca, but not identified.

MAMMILLARIA LORICATA Martius in Pfeiffer, Enum. Cact. 13. 1837.

Echinocactus loricatus Poselger, Allg. Gartenz. *21:* 107. 1853.
Coryphantha loricata Lemaire, Cactées 35. 1868.
Cactus loricatus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

Solitary, simple, globose, 4 to 5 cm. in diameter, glaucous-green; tubercles short-ovate, 4-angled at base; radial spines 12, spreading, rigid, yellow, 6 to 8 mm. long; central spines 2, stouter than the radials, 8 to 10 mm. long, black at tip, the upper one straight, the lower one curved; flowers and fruit not described.

This plant is recorded as of Mexican origin, but we have found no description of it subsequent to the original and it may never be identified. Förster referred it to *Mammillaria polythele*, but Schumann did not know it.

Mammillaria heteracantha was referred here as a synonym by Pfeiffer (Enum. Cact. 13. 1837). This plant was mentioned by Martius (Verz. Konig. Bot. Gard. München 127. 1829), but so far as we can learn was never described.

MAMMILLARIA MONOCENTRA Jacobi, Allg. Gartenz. **24:** 90. 1856.

Depressed-globose, up to 12 cm. high, about 8 cm. in diameter, umbilicate at apex; tubercles milky, somewhat rhomboid at base, a little flattened, not setose in their axils; radial spines 6, white with black tips, a little spreading; central spine solitary, stouter and longer than the radials, about 2.5 cm. long; flowers rather large, rose-colored; style rose-colored; stigma-lobes 6, reddish yellow.

Jacobi referred this plant, presumably of Mexican origin, to the group *Angulosae-tetragonae* of Salm-Dyck.

Schumann placed it among his list of little-known species; we know it from description only.

MAMMILLARIA NERVOSA CRISTATA Journ. Hort. Home Farm. III. **60:** (?) 7. 1910.

We know this plant only from a brief description and an illustration on pages 7 and 8 of the journal here cited:

"*Mammillaria nervosus cristatus* * grows in convoluted sinuosus masses like a great brain-mass. The growths are covered with spiny mamillae (whence the name of the genus) and are of a dull olive-brownish hue. It, too, is Mexican."

We are not able to place this plant; it resembles the cristate form sometimes assumed by *Pediocactus simpsonii* and also resembles *Mammillaria bicolor* as shown by the illustration under *M. daedalea.*

Illustration: Journ. Hort. Home Farm. III. **60:** 8 (or 7).

MAMMILLARIA NICHOLSONI Journ. Hort. Home Farm III. **60:** 7. 1910.

We know this species only from the illustration referred to below and the following brief note taken from the place of publication:

"*Mammillaria nicholsoni* resembles several of the Echinocactuses in external form. It was named we believe in honor of the late Mr. George Nicholson and came to Kew from the Swanley Collection. All our illustrations were secured at Kew where the collection is well cultivated. *M. nicholsoni* forms spherical masses with the typical protuberances or tubercles, these being tipped with sharp spines."

It is doubtless of Mexican origin.

Illustration: Journ. Hort. Home Farm. III. **60:** 9.

MAMMILLARIA NUDA De Candolle, Prodr. **3:** 460. 1828.

This is based on *Cactus nudus* (Mociño and Sessé, Pl. Mex. Sc. ined.), but has never been subsequently identified. It was also taken up by Otto Kuntze as *Cactus nudus* (Rev. Gen. Pl.

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* This is the original spelling.

1: 261. 1891). The original description was based on a drawing and calls for a cylindric, unbranched plant, bearing unarmed tubercles and rose-colored flowers.

MAMMILLARIA PICTA Meinshausen, Wöchenschr. Gärtn. Pflanz. 1: 27. 1858.

Cactus pictus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Globose to ovoid, dull green; tubercles cylindric, somewhat oblique, obtuse, their axils setose; spines pubescent; radial spines 12, yellowish at base, white near middle, above dark purple; central spines 1 (rarely 2), erect; flowers greenish white; stigma-lobes 3.

This species is known from the description only. It was recorded as from Mexico.

MAMMILLARIA PLECOSTIGMA Meinshausen, Wöchenschr. Gärtn. Pflanz. 1: 27. 1858.

Mammillaria plecostigma major Meinshausen, Wöchenschr. Gärtn. Pflanz. *1:* 27. 1858.
Mammillaria plecostigma minor Meinshausen, Wöchenschr. Gärtn. Pflanz. *1:* 27. 1858.
Cactus plecostigma Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Proliferous, the joints cylindric; tubercles cylindric, the apex oblique and rounded, with setae in their axils; radial spines 16 to 20, setaceous, white; central spines 3 or 4, at first yellow, becoming brown, one hooked at apex; flowers and fruit unknown.

Presumably of this genus and recorded as of Mexican origin; but not identified since it was described.

MAMMILLARIA PLINTHIMORPHA Jacobi, Allg. Gartenz. 24: 92. 1856.

Cespitose, forming clumps 15 cm. in diameter or more; joints globose; tubercles 4-angled, obtuse, bearing yellowish white wool in their axils; spines 4, subulate, somewhat angled, flesh-colored with blackish tips, the upper one the longest and sometimes more than 2.5 cm. long; flowers not known.

This plant was collected by Galeotti in Mexico in 1847; we do not know it and it was listed by Schumann among his little-known species.

MAMMILLARIA PULCHRA Haworth in Edwards's Bot. Reg. 16: pl. 1329. 1830.

Cactus pulcher Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

This species, which has yellow spines and dark-red flowers, was referred by Schumann, doubtfully, to *Mammillaria centricirrha*, and by Pfeiffer with doubt to *M. tentaculata.*

MAMMILLARIA RUTILA Zuccarini in Pfeiffer, Enum. Cact. 29. 1837.

Cactus rutilus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Simple, globose; axils of tubercles nearly naked; tubercles 1 cm. long, conic, dull green; areoles when young tomentose; radial spines 14 to 16, setiform, the upper ones smaller, 4 to 8 mm. long; central spines 4 to 6, spreading, rigid, 8 to 12 mm. long, curved, reddish brown, the lower one longest.

Type locality: Mexico.

This name is referred by Schumann to *M. coronaria.*

M. rutila pallidior Salm-Dyck (Cact. Hort. Dyck. 1849. 11. 1850) was never described, while *M. eugenia* (Salm-Dyck, Cact. Hort. Dyck. 1849. 11. 1850) is given as a synonym of *M. rutila.*

M. rutila octospina Scheidweiler (Bull. Acad. Sci. Brux. 6: 91. 1839) is breifly described.

MAMMILLARIA SAXATILIS Scheer, Bot. Herald 286. 1856.

Cactus saxatilis Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Plant small; spines brownish to straw-colored.

Only two plants were collected, somewhere in Mexico, by Potts and sent to Scheer; the flowers and fruit were not described. The species may never be identified.

MAMMILLARIA SCHMERWITZII Haage in Förster, Handb. Cact. ed. 2. 270. 1885.

Depressed-globose, 10 cm. in diameter, grassy green; radial spines 10 to 25, yellow, 4 to 5 mm. long; central spines 4 or 5, dark brown, 15 mm. long; flowers red.

This plant, recorded as of Mexican origin, was at one time offered for sale by A. Blanc and Company; we know it only from description and are unable to identify it.

MAMMILLARIA SEEMANNII Scheer in Seemann, Bot. Herald 288. 1856.

Cactus seemannii Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Hemispheric, stout, 10 cm. in diameter, 7.5 cm. high; tubercles somewhat ovoid, elongated, greenish, minutely punctate, their axils soon white-woolly; radial spines 11 to 13, nearly equal, less than 6 mm. long; central spines 1, shorter than the radials, subulate, straight, erect, blackish purple, becoming white.

This plant was sent to F. Scheer in 1850, who states that it came from Sonora or Durango. It is incompletely described and can not be identified. It may be a species of *Coryphantha.*

MAMMILLARIA SORORIA Meinshausen, Wochenschr. Gärtn. Pflanz. **1:** 28. 1858.

Cactus sororius Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Depressed-globose, 5 to 6 cm. high, 7.5 to 10 cm. in diameter, milky; tubercles angled, 12 mm. long, naked in their axils; radial spines 6, 4 mm. long; central spines 1, erect, stouter than the radials, blackish at apex; flowers greenish purple; stigma-lobes 4.

Recorded as of Mexican origin but otherwise unknown.

MAMMILLARIA SPINAUREA Salm-Dyck, Allg. Gartenz. **18:** 594. 1850.

Cactus spinaureus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Globose or becoming depressed; tubercles light green, somewhat 4-angled, gibbous at base, obtuse and oblique at apex, their axils woolly; radial spines about 12, slender, rigid, spreading; central spines 5 or 6, twice as long and stouter than the radials, recurved or reflexed, yellow.

The above was sent by John Potts from Chihuahua in 1850; Scheer thought that it might have been collected in Durango or Sonora. We have not been able to identify it.

MAMMILLARIA SUAVEOLENS Rümpler in Förster, Handb. Cact. ed. 2. 297. 1885.

About 4 cm. high; radial spines 13 to 15; central spines 4, brown; flowers and fruit unknown.

The above is unidentifiable from the brief description. It was grown in Germany from Mexican seed.

MAMMILLARIA TROHARTII Hildmann in Schumann, Gesamtb. Kakteen 586. 1898.

Simple or proliferous and densely cespitose, globose or somewhat depressed, glaucous-green, small (6 cm. in diameter); axils naked; areoles at first woolly, afterwards naked; tubercles very small, scarcely angled; radial spines 5, with brown tips; central spines solitary, dark brown, subulate; flowers and fruit unknown.

M. trohartii is of Mexican origin.

MAMMILLARIA UNISETA Quehl, Monatsschr. Kakteenk. **14:** 128. 1904.

Solitary, globose, about 5 cm. in diameter, somewhat depressed at apex; tubercles dark green, 4-angled; spines 6, about 3 mm. long, at first black, changing to gray; flowers and fruit unknown.

This plant was described from a specimen in the Botanical Garden at Halle of unknown origin, but doubtless from Mexico.

MAMMILLARIA VIPERINA J. A. Purpus, Monatsschr. Kakteenk. **22:** 148. 1912.

Cespitose, decumbent, cylindric, 1.5 to 2 cm. in diameter; tubercles very short, sometimes nearly globular; spines numerous, 5 mm. long, whitish brown to brownish black; flowers and fruit unknown.

This plant came from Río de Zapotitlán, Puebla; we know it only from description and the very characteristic published illustration. Quehl, who had seen it, said that it was a form of *Mammillaria elongata.* We believe that it is near *M. sphacelata* and perhaps a distinct species. The plant figured by Grässner (Haupt-Verz. Kakteen 38. 1914) shows nearly upright branches.

Illustration: Monatsschr. Kakteenk. **23:** 21, as *Mammillaria viperina.*

MAMMILLARIA ZEYERIANA Haage jr. in Schumann, Gesamtb. Kakteen 574. 1898.

Simple, hemispheric to short-cylindric, up to 10 cm. high, pale glaucous-green; tubercles in 13 or 21 spirals, terete, 10 to 12 mm. long, their axils naked; spine-areoles elliptic, 3 mm. long; radial spines 10, white; central spines 4, the uppermost one curved, 15 mm. long, brownish; flowers and fruit unknown.

Described from Mexican plants; supposed to be of Mexican origin.

PLANTS KNOWN BY NAME ONLY.

Mammillaria acicularis Lemaire (Cact. Gen. Nov. Sp. 34. 1839) was described without the flowers, fruit, or native country being known and has not been identified; here belongs *Cactus acicularis* (Kuntze, Rev. Gen. Pl. **1**: 261. 1891), but *C. acicularis* (Kuntze, Rev. Gen. Pl. **1**: 260. 1891) based on some name of Lehmann we have not been able to find.

Mammillaria aulacantha, referred by Schumann and the Index Kewensis to De Candolle's Revision (Mém. Mus. Hist. Nat. Paris **17**: 113. 1828), is not to be found at the place cited by them; here probably belongs *Cactus aulacanthus* Kuntze (Rev. Gen. Pl. **1**: 260. 1891).

Mammillaria beneckei Ehrenberg (Förster, Handb. Cact. 210. 1846; *Cactus beneckei* Kuntze, Rev. Gen. Pl. **1**: 260. 1891) was referred to *M. coronaria* by Schumann.

Mammillaria brandi is described in Blanc, Hints on Cacti, p. 67, as "a rare Mexican sort, with very long straw-colored spines deflecting from the plant. Flowers cream-colored and very fragrant."

Mammillaria centa is mentioned by C. A. Purpus in a short article in Die Gartenwelt (**9**: 249. 1905).

Mammillaria chrysantha is listed by De Candolle (Prodr. **3**: 460. 1828) among species little known but not described. It is said to have been in the Berlin Botanic Garden.

Mammillaria circumtexta Martius (Hort. Reg. Monac. 127. 1829) seems never to have been described.

Mammillaria hochderferi is mentioned by C. A. Purpus in a short article in Die Gartenwelt (**9**: 249. 1905).

Mammillaria multiradiata (Martius, Hort. Reg. Monac. 127. 1829) is only a name.

Mammillaria nigra Ehrenberg (Allg. Gartenz. **17**: 287. 1849) was referred to *M. coronaria* by Schumann; *Cactus niger* Kuntze (Rev. Gen. Pl. **1**: 261. 1891) is a synonym of it.

Mammillaria parmentieri Link and Otto (Verh. Ver. Beförd. Gartenb. **6**: 429. 1830), without description, was doubtfully referred to *M. flavescens.* It was supposed, however, to have come from Mexico.

The following species, briefly described by F. Schlumberger (Rev. Hort. IV. **5**: 404. 1856), we do not know, nor do we find them mentioned elsewhere:

Mammillaria albiseta, with flowers like those of *M. spinosissima.*

Mammillaria bocasiana, with clear yellow flowers.

Mammillaria cunendstiana, with flowers like those of *M. clillifera.*

Mammillaria decholara, with very small red flowers.

Mammillaria klenneirii, with rose-colored flowers.

Mammillaria roematactina, with abundant small rose-red flowers.

Mammillaria saluciana, flowers 1.5 cm. long and of the same diameter, flesh-colored.

The following names, without descriptions, appear in Förster's Handbuch (254, 255, 1846). Some of the names have been used subsequently, but so far as our observation goes they are all still *nomen nudum.* *Mammillaria asteriflora* Cels, *M. binops* Haage, *M. cantera* Haage, *M. citrina* Scheidweiler, *M. contacta* Wendland, *M. coryphides* Forbes, *M. crinigera* Otto, *M. daedalea viridis* Fennel, *M. echinops* Fennel, *M. enneacantha* Otto, *M. heteracentra* Otto, *M. intricata* Otto, *M. miqueliana* Pfeiffer, *M. palmeri* Fennel, *M. pyrrhacantha* Pfeiffer, *M. pyrrhacantha pallida* Pfeiffer, *M. salmina* Fennel, *M. stephani* Hortus, *M. suberecta* Pfeiffer, and *M. villosa* Fennel.

The following names appeared first, published by Forbes (Journ. Hort. Tour Germ. 147. 1837), but are so briefly described that they can not be identified: *Mammillaria cuneiflora* Hitchen, *M. cylindraca* Hitchen, *M. divaricata*, *M. flavescens* Hitchen, *M. grandis* Hitchen, *M. lutescens*, and *M. pulcherrima*. Some of these names were afterwards used, but whether they were applied to the same plants we can not tell.

The following names of *Mammillaria* listed by Haage (Cact. Kult. ed. 2. 1900) are without description: *brandtii* Haage jr., *bruennowii*, *celsiana longispina*, *de grandii*, *deluili* Rebut, *desertorum*, *donkelaari*, *dubia* Hildmann, *fulvolanata*, *geminiflora*, *glabrescens*, *goeringii*, *grusonii similis*, *guebwilleriana* Haage jr., *hermantiana* Monville, *hevernickii* Senke, *lapaixi* Rebut, *microdasys*, *monothele*, *morini* Rebut, *multicolor*, *nickelsi*, *nigerrima*, *numina*, *polia* Sieber, *queblii*, *rebuti*, *roii* Rebut, *roessingii* Gruson, *semilonia*, *simonis*, *tellii*, *variimamma* Ehrenberg, *villa-lerdo*, *wegeneri cristata*, and *xanthispina*.

Schumann, at the close of his treatment of the genus *Mammillaria* (Gesamtb. Kakteen 599. 1898), lists 158 names which he had not been able to refer. Later, Otto Kuntze referred many of the names to the genus *Cactus*, thus making many useless synonyms. Some of these names of Schumann we have been able to refer more or less definitely to other species, but there still remain many which we can not place. Most of them were described without flower and fruit, and since the types were not preserved it is doubtful if many more can be ever identified. The residue is as follows:

MAMMILLARIA ACTINOPLEA Ehrenberg, Allg. Gartenz. **16:** 266. 1848.

Mammillaria amabilis Ehrenberg, Allg. Gartenz. *17:* 326. 1849.
Mammillaria albiseta Hortus in Förster, Handb. Cact. ed 2. 354. 1885.
Cactus actinopleus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.
Cactus amabilis Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

Mammillaria crebrispina nitida Monville (Labouret, Monogr. Cact. 75. 1853) is known only as a synonym.

MAMMILLARIA ARGENTEA Fennel, Allg. Gartenz. **15:** 66. 1847.

Cactus argenteus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

MAMMILLARIA ATRORUBRA Ehrenberg, Allg. Gartenz. **17:** 327. 1849.

Cactus atroruber Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

MAMMILLARIA ATROSANGUINEA Ehrenberg, Allg. Gartenz. **17:** 270. 1849.

Cactus atrosanguineus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

MAMMILLARIA BADISPINA Förster, Hamb. Gartenz. **17:** 159. 1861.

MAMMILLARIA BARLOWII Regel and Klein, Ind. Sem. Hort. Petrop. **1860:** 46. 1860.

Cactus barlowii Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

MAMMILLARIA BERGENII Ehrenberg, Allg. Gartenz. **17:** 326. 1849.

MAMMILLARIA BIFURCA A. Dietrich, Allg. Gartenz. **18:** 186. 1850.

MAMMILLARIA BREVISETA Ehrenberg, Allg. Gartenz. **17:** 251. 1849.

Cactus brevisetus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

MAMMILLARIA CLOSIANA Roumey, Bull. Soc. Bot. France **2:** 372. 1855.

MAMMILLARIA COROLLARIA Ehrenberg, Allg. Gartenz. **17:** 294. 1849.

Cactus corollarius Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

MAMMILLARIA CORONATA Scheidweiler, Allg. Gartenz. **8:** 338. 1840.

Cactus coronatus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

MAMMILLARIA CURVISPINA Otto in Dietrich, Allg. Gartenz. **14:** 204. 1846.

Cactus curvispinus Kuntze, Rev. Gen. Pl. *1:* 260. 1891. Not Bertero, 1829.

MAMMILLARIA DECORA Förster, Hamb. Gartenz. **17:** 159. 1861.
Mammillaria decora obscura Förster, Hamb. Gartenz. *17:* 159. 1861.

MAMMILLARIA EBORINA Ehrenberg, Allg. Gartenz. **17:** 309. 1849.
Cactus eborinus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

MAMMILLARIA EMUNDTSIANA Hortus in Förster, Handb. Cact. ed. 2. 341. 1885.

MAMMILLARIA ERECTACANTHA Förster, Allg. Gartenz. **15:** 50. 1847.
Cactus erectacanthus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

MAMMILLARIA EUCHLORA Ehrenberg, Allg. Gartenz. **16:** 266. 1848.
Cactus euchlorus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

MAMMILLARIA FELLNERII Ehrenberg, Allg. Gartenz. **17:** 261. 1849.
Cactus fellneri Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

MAMMILLARIA FLAVA Ehrenberg, Allg. Gartenz. **17:** 261. 1849.
Mammillaria tomentosa flava Salm-Dyck, Cact. Hort. Dyck. 1849. 12. 1850.

MAMMILLARIA GEMINATA Scheidweiler, Allg. Gartenz. **9:** 42. 1841.
Cactus geminatus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

Illustration: Möllers Deutsche Gärt. Zeit. **25:** 475. f. 8, No. 20.

MAMMILLARIA GIBBOSA Salm-Dyck, Hort. Dyck. 343. 1834.
Cactus gibbosus Kuntze, Rev. Gen. Pl. *1:* 261. 1891. Not Haworth, 1812.

MAMMILLARIA GLABRATA Salm-Dyck, Cact. Hort. Dyck. 1849. 109. 1850.
Cactus glabratus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

MAMMILLARIA GRANDICORNIS Mühlenpfordt, Allg. Gartenz. **14:** 372. 1846.
Cactus grandicornis Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

MAMMILLARIA HAEMATACTINA Ehrenberg, Allg. Gartenz. **16:** 266. 1848.
Cactus haematactinus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

MAMMILLARIA INCURVA Scheidweiler, Bull. Acad. Sci. Brux. **6:** 92. 1839.
Cactus incurvus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

MAMMILLARIA JUCUNDA Ehrenberg, Allg. Gartenz. **17:** 250. 1849.
Cactus jucundus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

MAMMILLARIA KLEINII Regel, Ind. Sem. Hort. Petrop. **1860:** 47. 1860.
Cactus kleinii Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

MAMMILLARIA LAMPROCHAETA Jacobi, Allg. Gartenz. **24:** 82. 1856.

MAMMILLARIA LEUCODASYS Salm-Dyck in Scheer, Seemann, Bot. Herald 286. 1856.
Cactus leucodasys Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

Mexico. Probably *M. micromeris* Engelmann (*fide* Schumann).

MAMMILLARIA LEUCODICTIA Linke, Allg. Gartenz. **16:** 330. 1848.
Cactus leucodictyus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

MAMMILLARIA LIVIDA Fennel, Allg. Gartenz. **15:** 66. 1847.
Cactus lividus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

Mammillaria farinosa (Fennel, Allg. Gartenz. **15:** 66. 1847) is referred to *M. livida* by the Index Kewensis.

MAMMILLARIA MELANACANTHA Hortus in Förster, Handb. Cact. ed. 2. 386. 1885.

MAMMILLARIA MICANS Dietrich in Linke, Allg. Gartenz. **16:** 330. 1848.
Cactus micans Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

MAMMILLARIA MICRACANTHA Miquel, Linnaea **12:** 16. 1838.
Cactus micracanthus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

MAMMILLARIA MUCRONATA Ehrenberg, Allg. Gartenz. **17:** 294. 1849.
Cactus mucronatus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

MAMMILLARIA MULTISETA Ehrenberg, Allg. Gartenz. **17:** 242. 1849.
Cactus multisectus * Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

MAMMILLARIA OBLIQUA Ehrenberg, Allg. Gartenz. **17:** 250. 1849.
Cactus obliquus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

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* Kuntze's specific name is credited to Scheidweiler, but we do not find it.

MAMMILLARIA OBVALLATA Otto in Dietrich, Allg. Gartenz. **14:** 308. 1846.
Cactus obvallatus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

MAMMILLARIA OLORINA Ehrenberg, Allg. Gartenz. **17:** 326. 1849.
Cactus olorinus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

MAMMILLARIA OOTHELE Lemaire, Cact. Gen. Nov. Sp. 37. 1839.
Mammillaria ovimamma Lemaire, Cact. Gen. Nov. Sp. 49. 1839.
Mammillaria ovimamma brevispina Salm-Dyck, Cact. Hort. Dyck. 1849. 108. 1850.
Mammillaria ovimamma oothele Labouret, Monogr. Cact. 85. 1853.
Cactus oothele Kuntze, Rev. Glen. Pl. *1:* 261. 1891.
Cactus ovimamma Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

MAMMILLARIA PERSICINA Ehrenberg, Allg. Gartenz. **17:** 250. 1849.
Cactus persicanus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

MAMMILLARIA PHAEOTRICA Monville in Labouret, Monogr. Cact. 39. 1853.
Cactus phaeotrichus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

MAMMILLARIA PLEIOCEPHALA Regel and Klein, Ind. Sem. Hort. Petrop. **1860:** 47. 1860.
Cactus pleiocephalus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

MAMMILLARIA POLYMORPHA Scheer in Mühlenpfordt, Allg. Gartenz. **14:** 373. 1846.
Cactus polymorphus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

MAMMILLARIA PORPHYRACANTHA Jacobi, Allg. Gartenz. **24:** 81. 1856.

MAMMILLARIA PROCERA Ehrenberg, Allg. Gartenz. **17:** 241. 1849.
Cactus procerus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

MAMMILLARIA PUGIONACANTHA Förster, Allg. Gartenz. **15:** 50. 1847.
Cactus pugionacanthus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

MAMMILLARIA PUNCTATA Labouret in Förster, Handb. Cact. ed. 2. 293. 1885.

MAMMILLARIA PURPURASCENS Ehrenberg. Allg. Gartenz. **17:** 260. 1849.

MAMMILLARIA PURPUREA Ehrenberg, Allg. Gartenz. **17:** 270. 1849.
Cactus purpureus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

MAMMILLARIA REGIA Ehrenberg, Allg. Gartenz. **17:** 269. 1849.
Cactus regius Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

MAMMILLARIA ROSEA Scheidweiler, Hort. Belge **5:** 118. 1838.
Mammillaria rhodeocentra Lemaire, Cact. Gen. Nov. Sp. 52. 1839.
Mammillaria discolor nigricans Salm-Dyck in Walpers, Repert. Bot. *2:* 271. 1843.
Mammillaria rhodeocentra gracilispina Salm-Dyck, Cact. Hort. Dyck. 1849. 14. 1850.
Cactus roseus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.
Cactus rhodeocentrus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

Salm-Dyck referred *Mammillaria rosea* to *M. rhodeocentra,* but the former is the older name.

Illustration: Hort. Belge **5:** pl. 7, as *Mammillaria rosea.*

MAMMILLARIA RUFIDULA Ehrenberg, Allg. Gartenz. **17:** 295. 1849.
Cactus rufidulus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

MAMMILLARIA RUFO-CROCEA Salm-Dyck, Cact. Hort. Dyck. 1849. 102. 1850.
Cactus rufo-croceus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

MAMMILLARIA RUSCHIANA Regel, Ind. Sem. Hort. Turic. 4. 1830, in adnot.
Cactus rueschianus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

MAMMILLARIA SEIDELII Terscheck, Suppl. Cact. Verz. 1.
Cactus seidelii Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

MAMMILLARIA SEVERINI Regel and Klein, Ind. Sem. Hort. Petrop. **1860:** 46. 1860.
Cactus severinii Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

MAMMILLARIA SPECIOSA De Vriese, Tijdschr. Nat. Geschr. **6:** 52. 1839. Not Gillies, 1830.
Cactus vrieseanus Kuntze, Rev. Gen. Pl. *1:* 260. 1891.

MAMMILLARIA SPECTABILIS Mühlenpfordt, Allg. Gartenz. **13:** 346. 1845.
Cactus spectabilis Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

MAMMILLARIA SUBULIFERA Ehrenberg, Allg. Gartenz. **17:** 242. 1849.
Cactus subulifer Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

MAMMILLARIA TECTA Miquel, Linnaea **12:** 12. 1838.
Cactus tectus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

MAMMILLARIA TOMENTOSA Ehrenberg, Allg. Gartenz. **17**: 262. 1849.
Cactus tomentosus Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

MAMMILLARIA VARIMAMMA Ehrenberg, Allg. Gartenz. **17**: 242. 1849.
Cactus varimamma Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

MAMMILLARIA WEGENERI Ehrenberg, Bot. Zeit. **1**: 738. 1843.
Cactus wegeneri Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

MAMMILLARIA ZEGSCHWITZII Terscheck, Suppl. Cact. Verz. 1.
Cactus zegschwitzii Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

MAMMILLARIA ZEPNICKII Ehrenberg, Bot. Zeit. **2**: 835. 1844.
Cactus zepnickii Kuntze, Rev. Gen. Pl. *1:* 261. 1891.

NAMES TO BE EXCLUDED FROM THIS GENUS.

The names *Mammillaria solitaria, M. spinosa, M. caudata, M. ambigua,* and *M. quadrata,* credited to G. Don, with the synonyms *Cactus solitarius, C. spinosus, C. caudatus, C. ambiguus* [Not Bonpland, 1813], and *C. quadratus,* credited to Gillies, respectively, each with a single word description viz., solitary, spiny, tailed, ambiguous, quadrate; appeared in 1830 (Loudon, Hort. Brit. 194). As they all are said to come from Chile they can not be of this alliance.

Mammillaria brachydelphys Schumann (Just, Bot. Jahresb. **26**: 343. 1898) seems to have been intended for *Maihuenia brachydelphys.*

Cereus caudatus Gillies (Sweet, Hort. Brit. ed. 3. 285. 1839) is probably the same as *M. caudata.*

Mammillaria corioides Bosch (Sweet, Hort. Brit. ed. 3. 281. 1839) was described as leather-like and native of South America. It can not be identified, but it is not of this relationship if it comes from South America. Schumann referred it to *Echinocactus,* but it does not belong to that genus as we now define it.

Mammillaria dichotoma (Sweet, Hort. Brit. ed. 3. 281. 1839), described only as forked, can not be identified.

Mammillaria mitis (De Candolle, Prodr. **3**: 460. 1828), without description, is credited to Miller (Dict. Gard.), but Miller never used the generic name *Mammillaria.* Pfeiffer and Förster also refer this name to Miller. Steudel states that it is from South America. Kuntze also refers to the same as *Cactus mitis* (Rev. Gen. Pl. **1**: 259. 1891). Schumann thought that it might be an *Echinocactus* and, if it really came from South America, as stated by the Index Kewensis, it is probably of the *Echinocactanae.*

Mammillaria speciosa Gillies (Sweet, Hort. Brit. ed. 2. 235. 1830), to which *Cactus speciosus* Gillies is referred as a synonym, is based upon some Chilean plant.

Mammillaria subulata Mühlenpfordt is listed both by Schumann and the Index Kewensis but the name intended was *Pereskia subulata!*

MAMMILLARIA CHILDSI Blanc, Illustr. Cat. 14. 1894.

"This fine *Mammillaria* was sent out by us as *M. pectinata* before we bloomed it, from the fact that small plants answered the description exactly. After blooming, however, we discovered that it was a valuable new variety and named it as above. When small, the spines are regular, short and white; as the plant becomes older the spines also increase in size and assume a beautiful purple color. Flowers very numerous, even on small plants; color a clear pink."

We have not been able to identify this plant definitely. From the illustration, which shows large flowers from the center of the plant, we judge that it can not be referred to *Neomammillaria* nor to any of its near relatives. It may be a *Coryphantha;* in fact, at first it was taken for *C. pectinata.* The spines, however, are shown as arranged on vertical ribs, while the central spine is shown as erect; these two characters along with the central purple flowers suggest *Echinomastus erectocentrus.*

Illustration: Blanc, Illustr. Cat. 14.

Mammillaria coronaria Haworth, Rev. Pl. Succ. 69. 1821, as to name.

> *Cactus coronatus* Willdenow, Enum. Pl. Hort. Berol. Suppl. 30. 1813. Not Lamarck, 1783.

Judging from Willdenow's original descriptions of this plant it is not of this genus. He says that it is 5 feet long and a foot in diameter and that the central spine of the areole is hooked. Its geographical origin was not recorded and its flowers were not described. It was grown at Berlin prior to 1813 and later at the Chelsea Garden, London. Descriptions of this species are based largely on *Cactus cylindricus* Ortega, a very different plant.

Through the courtesy of N. E. Brown we have a photograph of *Mammillaria coronaria* from Haworth's collection with the date "Feb. 20, 1846." This photograph answers Haworth's brief description and differs from Willdenow's in having the spines all straight. Haworth's plants we would refer to *Neomammillaria.*

Cactus coronarius Willdenow, given by Haworth as a synonym of *Mammillaria coronaria,* is a mistake for *C. coronatus.*

The variety *Mammillaria coronaria minor* was briefly described by Förster (Handb. Cact. 212. 1846).

Mammillaria fulvispina Haworth, Phil. Mag. 7: 108. 1830.

> *Cactus fulvispinus* Kuntze, Rev. Gen. Pl. 1: 260. 1891.
> *Mammillaria rhodantha fulvispina* Schelle, Handb. Kakteenk. 257. 1907.

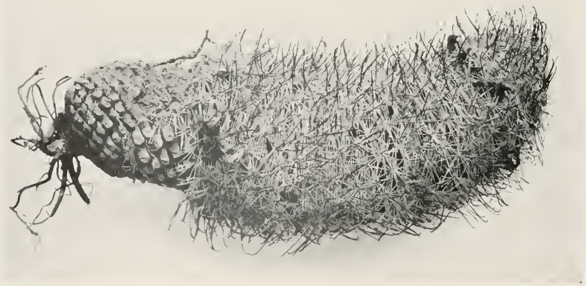
This plant was said by Haworth to come from Brazil and if so it is to be excluded from this relationship. Pfeiffer associated the name with a Mexican specimen which has led to its being referred by later writers to *M. rhodantha.* The varieties *M. fulvispina media* and *M. fulvispina minor* (Salm-Dyck, Cact. Hort. Dyck. 1844. 8. 1845) were not described.

Mammillaria picturata Labouret, Rev. Hort. IV. 4: 28. 1855.

Simple, cylindric, 8 cm. high, 5 cm. in diameter; radial spines 20, white, setiform, 4 mm. long; central spines 6, yellowish; flowers and fruit unknown.

Although Labouret stated that this plant came from Mendoza, Argentina, the Index Kewensis says Chile. If it is in southern South America, it does not belong to *Neomammillaria.*

The illustration (figure 184*a*) at the bottom of this page is of *Neomammillaria milleri* described on page 156.



Subtribe 7. EPIPHYLLANAE.

Mostly epiphytic and night-bloming cacti, generally growing on trees, but sometimes on the earth when this is rich in humus, rarely in the crevices of rocks, much branched, spineless (except *Eccremocactus* and some species of *Epiphyllanthus*); joints several or many, usually flat except at base, often thin, with the areoles borne along the margin (except in *Epiphyllanthus*); flowers regular (except in *Zygocactus* and *Epiphyllanthus*); perianth various; filaments usually long and slender; style long and slender; fruit spineless, usually red or purple, either naked or bearing a few scales (rarely many), these usually with naked axils; seeds small, black.

We recognize 9 genera, diverse both in the plant-body and in the flowers. While apparently not closely related among themselves, the genera forming this subtribe are not any more closely related to other genera, either in the *Cereanae* or in the *Rhipsalidanae*.

KEY TO GENERA.

Plants branching dichotomously.
Perianth irregular.
Joints thin and leaf-like with toothed margin; areoles all marginal . . . . 1. *Zygocactus* (p. 177)
Joints thick, without teeth, bearing areoles all around . . . . 2. *Epiphyllanthus* (p. 180)
Perianth regular or nearly so; joints thin . . . . 3. *Schlumbergera* (p. 182)
Plants branching irregularly.
Perianth-segments spreading or reflexed; flowers mostly large.
Tube of flower definitely longer than limb . . . . 4. *Epiphyllum* (p. 185)
Tube of flower not longer than limb.
Perianth campanulate, its segments few.
Stamens few; flowers small . . . . 5. *Disocactus* (p. 201)
Stamens many; flowers large . . . . 6. *Chiapasia* (p. 203)
Perianth short-funnelform, its segments many.
Outer perianth-segments short, obtuse or rounded, the inner white . . . . . . 7. *Eccremocactus* (p. 204)
Outer perianth-segments acute or acuminate, the inner rose or red . . . . . . 8. *Nopalxochia* (p. 204)
Perianth-segments erect; flowers small . . . . 9. *Wittia* (p. 206)

1. ZYGOCACTUS Schumann in Martius, Fl. Bras. 4^2: 223. 1890.

Stems dichotomously much branched, flattened, divided into short joints; flowers terminal, polychromic, irregular; ovary terete, smooth, gradually broadening from base, bearing minute scales at top; flower-tube abruptly bent just above the ovary, ending in a serrate mouth, bearing petaloid spreading scales scattered along its sides; stamens slender, white, arranged in 2 clusters; outer stamens borne along inside of flower-tube from near base to near middle; inner clusters of stamens about 20, arising from center and forming a short tube about base of style with an inner deflexed toothed membrane, upper part free, and all appressed against upper side of flower-tube and uppr perianth-segments; style purple, slender, as long as stamens and usually not surrounded by them; stigma-lobes linear, purple, erect and adhering (so far as we have seen); fruit purple, turgid, not at all angled; skin thin; seeds dark brown to nearly black, shining.

Type species: *Epiphyllum truncatum* Haworth.

This genus has passed for many years under the name of *Epiphyllum* but that name was wrongly applied to it. One species is here recognized, although several have been proposed by previous authors.

The generic name is from the Greek, meaning yoke and from the Greek, meaning cactus, referring, doubtless, to the peculiarly jointed stems.

1. Zygocactus truncatus (Haworth) Schumann in Martius, Fl. Bras. 4^2: 224. 1890.

Epiphyllum truncatum Haworth, Suppl. Pl. Succ. 85. 1819.
Cactus truncatus Link, Enum. Pl. *2:* 24. 1822.
Cereus truncatus Sweet, Hort. Brit. 272. 1826.
Epiphyllum altensteinii Pfeiffer, Enum. Cact. 128. 1837.
Epiphyllum truncatum altensteinii Lemaire, Cact. Gen. Nov. Sp. 76. 1839.
Epiphyllum purpurascens Lemaire, Hort. Univ. *2:* 349. 1841.
Epiphyllum truncatum violaceum Morren, Belg. Hort. *16:* 260. 1866.
Epiphyllum truncatum spectabile Morren, Belg. Hort. *16:* 260. 1866.
Zygocactus altensteinii Schumann in Martius, Fl. Bras. *4^2:* 225. 1890.
Epiphyllum delicatum N. E. Brown, Gard. Chron. III. *32:* 411. 1902.
Epiphyllum delicatulum Schumann, Monatsschr. Kakteenk. *13:* 9. 1903.
Zygocactus delicatus Britton and Rose, Contr. U. S. Nat. Herb. *16:* 260. 1913.

Joints dark glossy green, about 3 cm. long, sharply serrate, with two prominent teeth at otherwise truncate apex; terminal areole broad and thin, filled with brown wool and bristles; flowers 6 to 7 cm. long;

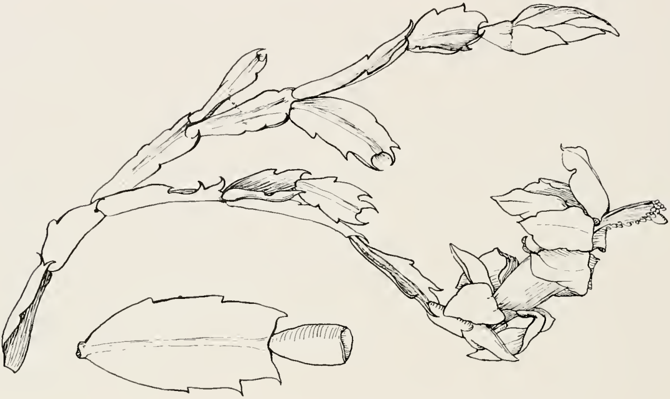
tube 2 cm. long; inner perianth-segments scarlet to white, oblong, obtuse to acute, reflexed; filaments white; style purple throughout; fruit obovoid, 1.5 to 2 cm. long.

Type locality: Brazil.

Distribution: Mountains, state of Rio de Janeiro, Brazil.

This species has been cultivated widely for many years under various names. It was introduced into cultivation about 1818 and, according to Edwards, flowered first in England in 1822 and has since been a great favorite as a household plant, blooming freely about the end of the year, hence the name Christmas cactus. It is also called crab cactus and ringent-flowered cactus.

Schumann gives as synonyms of this species *Epiphyllum salmoneum* and *E. spectabile,* referring them to Cels's Catalogue, which, however, we have not seen.



Figs. 185 and 186.—Flowering branch and fruiting joint of Zygocactus truncatus.

Cereus truncatus altensteinii (Salm-Dyck, Hort. Dyck. 65. 1834) occurs in literature, sometimes attributed to Otto, but we have seen no description. We follow Löfgren, who refers *Zygocactus altensteinii* to *Z. truncatus.* The type came from the Organ Mountains near Rio de Janeiro; in 1915, Dr. Rose visited these mountains, where he found the true *Z. truncatus.*

There are many garden varieties, most of which are very beautiful. Among these are *Epiphyllum gibsonii,* introduced in 1886, with dark orange-red flowers, and *Epiphyllum guedeneyi,* of unknown origin, with large flowers, the outer segments white, tinged with sulphur, and the inner ones creamy white; the variety is referred by some to *Phyllocactus guedeneyi.* Nicholson (Dict. Gard. 1: 517) describes some of the best as follows:

> "*Bicolor,* white, edged with rose; *coccineum,* rich deep scarlet; *elegans,* bright orange-red, centre rich purple; *magnificum,* flowers large, white, tips bright rose-colored; *roseum,* bright rose; *ruckerianum,* deep reddish purple, with a rich violet centre; *salmoneum,* reddish salmon; *spectabile,* white, with delicate purple margin; *violaceum superbum,* pure white, rich deep purple edge."

Rümpler (Förster, Handb. Cact. ed. 2. 870, 871. 1885) described nine varieties, among which are *cruentum* and *tricolor; E. truncatum cruentum* was also briefly described by Morren (Belg, Hort. 16: 260. 1866). Among other varieties are *albiflorum, aurantiacum, grandidens, minus, purpuraceum,* and *vanhoutteanum.*

Epiphyllum ruckeri Paxton (Mag. Bot. **12:** 46. 1846) was described from cultivated plants of unknown origin as an improved variety of *Epiphyllum truncatum*. It may have been a hybrid.

Epiphyllum truncatum multiflorum was given as a synonym of *Epiphyllum altensteinii* by Pfeiffer (Enum. Cact. 128. 1837).

Epiphyllum elegans Cels and *E. violaceum* Cels (Förster, Handb. Cact. 446. 1846) were supposed to be only varieties of *Epiphyllum truncatum*.

Schelle (Handb. Kakteenk. 223. 1907) lists more than fifty forms of *Epiphyllum truncatum;* the following not hitherto mentioned by us under *Epiphyllum* have the regular Latin form:

amabile roseum
carmineum
gracile
grandiflorum rubrum
harrisonii
lateritium album
makoyanum
maximum
morellianum
pallidum roseum
purpureum
rubrum violaceum
salmoneum aurantiacum
salmoneum brasiliense
salmoneum flavum
salmoneum marginatum
salmoneum rubrum
snowi
spectabile carmineum
spectabile superbum
splendens
translucens
violaceum album
violaceum grandiflorum
superbum

Illustrations: Nov. Herb. Amat. pl. 83; Loudon, Encycl. Pl. 413. f. 6903; Loddiges, Bot. Cab. **13:** pl. 1207; Curtis's Bot. Mag. **52:** pl. 2562; Edwards's Bot. Reg. **9:** pl. 696; Reichenbach, Fl. Exot. pl. 325; Hooker, Exot. Fl. **1:** pl. 20, as *Cactus truncatus;* Wiener Ill. Gart. Zeit. **18:** 265. f. 55, as *Phyllocactus delicatus;* Blühende Kakteen **1:** pl. 25; Cact. Journ. **1:** 34, 114; Cycl. Amer. Hort. Bailey **2:** f. 765; Engler and Prantl, Pflanzenfam. 3^{6a}: f. 61, A, B, C; Schumann, Gesamtb. Kakteen f. 9, 43; Hort. Univ. **7:** facing 132; Karsten, Deutsche Fl. 887. f. 501, No. 3; ed. 2. **2:** 456. f. 605, No. 3; Förster, Handb. Cact. ed. 2. 129. f. 5; Rümpler, Sukkulenten f. 87; Hort. Franc. II. **4:** pl. 3; Schelle, Handb. Kakteenk. 223. f. 145; Balt, Cact. Journ. 1: 49; Floralia **42:** 375; Gard. Chron. **1847:** 324; II. **6:** 808. f. 148; III. **7:** 173. f. 29; III. **19:** f. 1; West Amer. Sci. **7:** 172; Amer. Gard. **11:** 534; Schelle, Handb. Kakteenk. 224. f. 146; 225. f. 147; Rother, Praktischer Leitfaden Kakteen 104; Belg. Hort. **16:** pl. opp. 257; also the vars. *spectabile, cruentum,* and *violaceum;* Deutsches Mag. Gart. Blumen. **1852:** pl. opp. 176. f. 2; Gartenwelt **4:** 230; Gobel, Pflanz. Schild. **1:** f. 55 (seedling); Garten-Zeitung **4:** 182. f. 42, No. 2; Jacquin, Ecl. Pl. Rar. **2:** pl. 142, as *Epiphyllum truncatum;* Pfeiffer and Otto, Abbild. Beschr. Cact. **1:** pl. 28, as *E. altensteinii;* Gard. Chron. III. **32:** f. 140, as *E. delicatum;* Schumann, Gesamtb. Kakteen Nachtr. f. 9; Monatsschr. Kakteenk. **13:** 7, as E. *deli-*

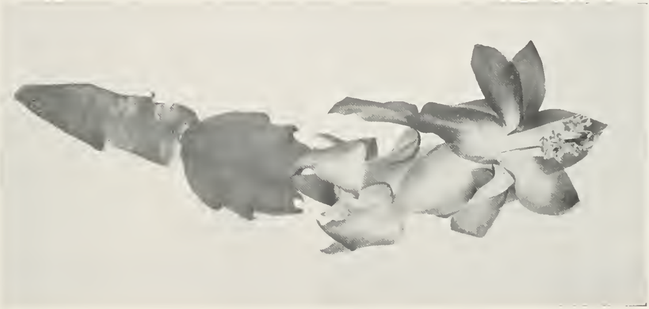


FIG. 187.—Zygocactus truncatus.

catulum: Deutsches Mag. Gart. Blumen. **1852:** pl. opp. 176, f. 1, as *E. truncatum elegans;* Arch. Jard. Bot. Rio de Janeiro **2:** pl. 3, as *Zygocactus delicatus;* Van Géel, Sert. Bot. **1:** pl. 117, as *Cactus truncatus;* Martius, Fl. Bras. 4^2**:** pl. 46; Contr. U. S. Nat. Herb. **16:** pl. 80; Stand. Cycl. Hort. Bailey **6:** f. 4055.

Figure 185 shows a plant in the New York Botanical Garden which flowered December 15, 1911; figure 186 shows a fruiting joint collected by Dr. Rose in the Organ Mountains of Brazil in 1915 (No. 20819); figure 187 is from a photograph of a cultivated plant obtained by Dr. Rose in the Botanical Garden at Rio de Janeiro in 1915 (No. 20855).

2. EPIPHYLLANTHUS Berger (Rep. Mo. Bot. Gard. **16:** 84. 1905.

Plants either epiphytic or growing in shade of rock in rich humus, often in clumps, more or less branched; joints globular, cylindric or much flattened; areoles scattered over surface of joints, circular, tomentose, either with or without spines; flowers zygomorphic, slender, purple to white; stamens somewhat exserted, arranged in 2 series, those forming the inner series united at base; style slender, a little longer than stamens; ovary angled, bearing a few small scales; fruit small.

Type species: *Epiphyllanthus obtusangulus* Berger.

The type of this genus has long been treated as a species of *Cereus,* although its dissimilarity to *Cereus* proper or to any of its immediate relatives must have been observed. It was left to Alwin Berger to call attention to its true alliance and to propose for it a new generic name; his statement regarding it is so clear that we quote from it as follows:

> "This very strange little plant, still rare in cultivation, can not beconsidered either a *Cereus* or an *Epiphyllum.* But no doubt it is much more nearly allied to the latter than to the former genus. Schumann brought it into *Cereus* on account of its round and ribbed stems, but there exists no *Cereus* of a similar articulated growth; only with *Rhipsalis* and *Epiphyllum* can it be compared. The plant resembles somewhat a minute *Platyopuntia.* The joints are slightly flattened and have numerous little prominent areoles distributed spirally all over the surface. In this it differs greatly from *Epiphyllum* with which it agrees in all the characters of the flowers, the angular, nearly alate ovary, and especially in the inner stamens being united at the base into a small incurved membrane. Also, the fruit resembles more that of an *Epiphyllum* than that of a *Cereus.* The flowers rise from the top of the joints as in *Epiphyllum.* The plant is best considered as generically different from both, but must be placed with *Epiphyllum* and *Rhipsalis* among the *Inarmatae* of K. Schumann."

We recognize 3 species, all from central Brazil. All occur on the high mountain Itatiaya, province of Rio de Janeiro; what their actual relationships may be can be determined only by further field observations. They may all be referable to one variable species.

The generic name was given because of the resemblance of the flowers of the type species to those of *Epiphyllum truncatum* (*Zygocactus*).

KEY TO SPECIES.

Joints or some of them flattened, *Opuntia*-like .... 1. *E. obovatus*
Joints terete or obtusely angled.
  Flowers purple to rose .... 2. *E. microsphaericus*
  Flowers white .... 3. *E. candidus*

1. Epiphyllanthus obovatus (Engelmann).

Epiphyllum obovatum Engelmann in Schumann, Gesamtb. Kakteen 224. 1897.
Epiphyllum opuntioides Löfgren and Dusén, Arch. Mus. Nac. Rio de Janeiro *13:* 49. 1905.
Zygocactus opuntioides Löfgren, Arch. Jard. Bot. Rio de Janeiro *2:* 26. 1918.

Usually growing in shade of rocks, at first erect, becoming more or less decumbent, very much branched; joints usually 5 to 7 cm. long, obovate to oblong, more or less flattened, often suggesting small joints of some *Opuntia,* bearing scattered areoles and these often spinescent; old and lower joints often nearly terete, bearing large areoles with numerous short yellow spines; flowers 5 cm. long, purple; ovary naked.

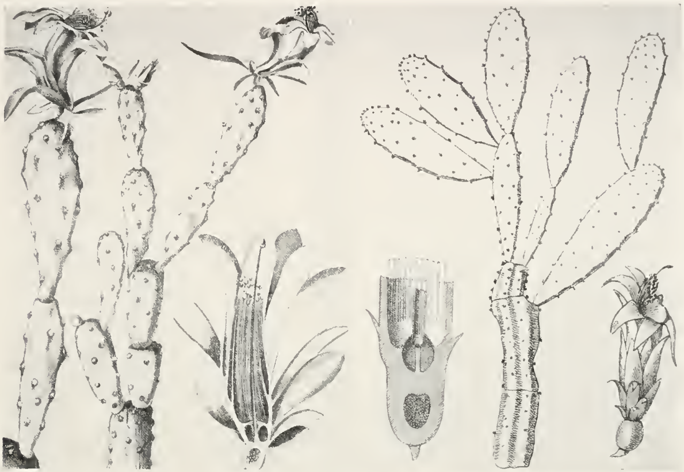
Type locality: Brazil.

Distribution: Central Brazil.

Dr. Rose collected this species on Itatiaya, altitude about 2,300 meters, in July 1915 (No. 20495); the plant did not do well in cultivation with us and his specimens died.

Illustrations: Arch. Jard. Bot. Rio de Janeiro **2:** pl. 4, as *Zygocactus opuntioides;* Arkiv Bot. Stockholm **8:** pt. 7. 10, as *Epiphyllum opuntioides.*

Figure 188 is reproduced from the first illustration cited above; figure 189 is reproduced from the second illustration cited above.



Figs. 188 and 189.—Epiphyllanthus obovatus.

2. Epiphyllanthus microsphaericus (Engelmann).

Cereus microsphaericus Schumann in Martius, Fl. Bras 4^2*:* 197. 1890.
Cereus parvulus Schumann in Martius, Fl. Bras. 4^2*:* 197. 1890.
Cereus obtusangulus Schumann in Martius, Fl. Bras. 4^2*:* 198. 1890.
Cereus anomalus Schumann, Keys Monogr. Cact. 16. 1903.
Epiphyllanthus obtusangulus Berger, Rep. Mo. Bot. Gard. *16:* 84. 1905.
Zygocactus obtusangulus Löfgren, Arch. Jard. Bot. Rio de Janeiro *2:* 28. 1918.

Low, at first erect, much branched and more or less prostrate, growing under rocks and perhaps epiphytic on trees; joints slender, terete or obtusely angled, somewhat spiny or often naked; flowers all terminal, purple to rose.

Type locality: Province of Rio de Janeiro, Brazil.

Distribution: Central Brazil.

Dr. Rose collected this species on Itatiaya, Brazil, in 1915 (No. 20494), growing at higher altitudes than *E. obovatus.*

Epiphyllum obtusangulum Lindberg (Martius, Fl. Bras. 4^2**:** 198. 1890), usually referred here as a synonym, has not been published.

Illustrations: Arch. Jard. Bot. Rio de Janeiro **2:** pl. 5, as *Zygocactus obtusangulus;* Schumann, Gesamtb. Kakteen f. 30, as *Cereus obtusangulus.*

Figure 190 is reproduced from the first illustration cited above.

3. Epiphyllanthus candidus (Löfgren).

Zygocactus candidus Löfgren, Arch. Jard. Bot. Rio de Janeiro *2:* 30. 1918.

Usually epiphytic on shrubs, but sometimes growing in the shade of large boulders; joints usually terete or nearly so, 2 to 4 cm. long, naked or sometimes bristly; flowers solitary, terminal, white; fruit globose, red.

Type locality: On Itatiaya, Brazil.

Distribution: Known only from the type locality.

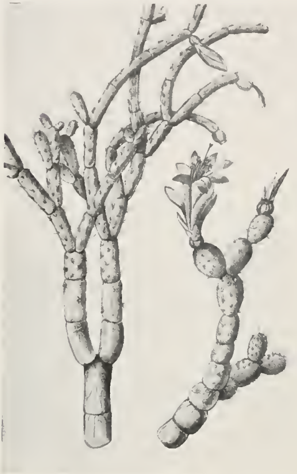


FIG. 190.—Epiphyllanthus microsphaericus.

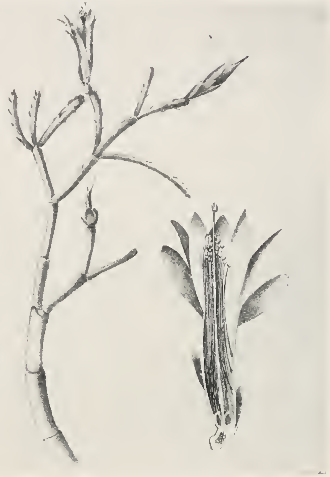


FIG. 191.—Epiphyllanthus candidus.

Dr. Rose collected this species on the very top of Itatiaya, growing in the shade of rocks (No. 20610) and in the deep cleft of the rock cap through which the ascent to the top is made.

Epiphyllum candidum Barboso-Rodriques (Arch. Jard. Bot. Rio de Janeiro **2:** 30. 1918) is only a name.

Illustration: Arch. Jard. Bot. Rio de Janeiro **2:** pl. 6, as *Zygocactus candidus.*

Figure 191 is reproduced from the illustration cited above.

3. SCHLUMBERGERA Lemaire, Rev. Hort. IV. 7 253. 1858.

Similar in habit to *Zygocactus;* stems much branched; joints short, crenate or serrate, mostly flattened; flowers purple to scarlet, regular; tube very short; stamens in 2 clusters, one scattered over the throat, the other forming a short tube at base of flower and surrounding style or free at base; ovary and fruit strongly 5-angled, naked or rarely bearing areole on one of the ribs and crowned by 5 more or less persistent, sepal-like scales; fruit hard, often remaining on plant for a long time.

Type species: *Epiphyllum russellianum* Hooker.

The taxonomic history of the two species here recognized is interesting. *Schlumbergera gaertneri* was at first supposed to be conspecific with *S. russelliana* and was made a variety of that species by Regel. In 1890 Schumann considered them distinct species but congeneric; in 1897 he referred them to different genera. Both species are native of Brazil.

These plants have usually been associated with *Zygocactus truncatus* and all included in *Epiphyllum.* Although resembling *Zygocactus* very much in habit, they differ from it in flower and fruit characters. The flowers are nearly regular, not strongly oblique; are nearly rotate, not elongated; the stamens are of equal length and in a cylindric cluster shorter than the style, not of unequal lengths and in a flattened cluster, not extending beyond the style; the ovary and fruit are strongly angled, not terete.

Lemaire named the genus for Frederick Schlumberger, an amateur student of plants and a collector of cacti, begonias, and bromelias.

KEY TO SPECIES.

Flowers scarlet .... 1. *S. gaertneri*
Flowers purplish .... 2. *S. russelliana*

1. **Schlumbergera gaertneri** (Regel) Britton and Rose, Contr. U. S. Nat. Herb. **16**: 260. 1913.

Epiphyllum russellianum gaertneri Regal, Gartenflora *33:* 323. 1884.
Epiphyllum makoyanum W. Watson, Gard. and For. *2:* 243. 1889.
Epiphyllum gaertneri Schumann in Martius, Fl. Bras. 4^2: 218. 1890.
Phyllocactus gaertneri Schumann in Rümpler, Sukkulenten 147. 1892.

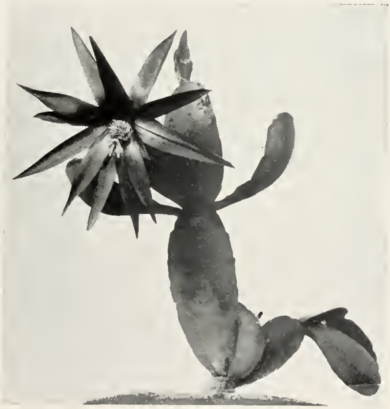


FIG. 192.—Schlumbergera gaertneri.

Branches spreading, the terminal ones often pendent; joints usually flattened, but sometimes 3 to 6-angled, fleshy, 5 cm. long or more by 2 cm. broad, dull green except the purplish crenate margins; areoles small, with short white wool and a few yellowish bristles; flowers 1 to 3, usually all at distal end of the terminal branches, 4 cm. long, dark scarlet; outermost perianth-segments usually 5, short, thick, triangular, drying separately from the others; outer perianth-segments spreading; innermost perianth-segments more erect, nearly distinct, acute; all of the segments, except the 5 outer ones, more or less coalesce and withering, remaining on top of ovary; ovary crowned by a slightly depressed disk or umbilicus with upturned margin, which passes into the flower-tube; on the margin are borne the free stamens; style slender, 1.5 cm. long, red; stigma-lobes 6, linear, cream-colored; ovary dark red, angled, 12 mm. long; fruit red, oblong, 15 mm. long, depressed at apex, in cultivation ripening in July.

Type locality: Minas Geraes, Brazil.

Distribution: Brazil.

While the joints are usually much flattened, yet they are somtimes strongly angled. In some cases too the juvenile growth is peculiar, forming short stubby joints with 6 ribs, with closely set areoles, each bearing a cluster of 7 or more bristly spines.

The plant flowers abundantly in Washington in April.

The two varieties *Epiphyllum gaertneri coccineum* and *E. gaertneri mackoyanum* (Monatsschr. Kakteenk. 7: 101. 1897) are doubtless forms of this species.

Illustrations: Wiener Ill. Gart. Zeit. **10:** 136. f. 60; Rev. Hort. **59:** pl. opp. 516; Blanc, Cacti 64. 1002; Cact. Journ. **1:** 9, 114; Gartenflora **33:** pl. 1172; **39:** f. 96; Rev. Hort. Belg. **15:** f. 23; pl. [19.] f. 2, opp. 229, as *Epiphyllum russellianum gaertneri:* Schelle, Handb. Kakteenk. 213. f. 141; Curtis's Bot. Mag. **117:** pl. 7201; Gartenwelt **10:** 559, as *Epiphyllum gaertneri:* Blühende Kakteen **1:** pl. 21; Thomas, Zimmerkultur Kakteen 19; Monatsschr. Kakteenk. **4:** 107; Rümpler, Sukkulenten 148. f. 80, as *Phyllocactus gaertneri;* Rev. Hort. Belg. **15:** pl. [19.] f. 1, opp. 229; Journ. Hort. Home Farm. III. **18:** 362. f. 58, as *Epiphyllum makoyanum.*

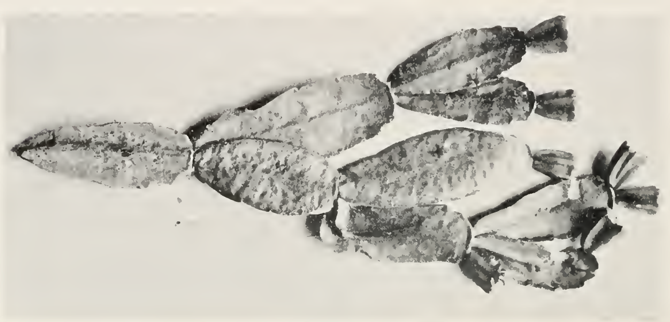


Fig. 193.—Schlumbergera gaertneri.

Figure 192 is from a photograph of a plant which flowered in the New York Botanical Garden in 1912; figure 193 shows a fruiting plant in the collections of the U. S. Department of Agriculture at Washington, D. C.

2. **Schlumbergera russelliana** (Gardner) Britton and Rose, Contr. U. S. Nat. Herb. **16:** 261. 1913.

Cereus russelianus Gardner in Lemaire, Hort. Univ. *1:* 31. 1839.
Epiphyllum russellianum Hooker in Curtis's Bot. Mag. *66:* pl. 3717. 1840.
Phyllocactus russelianus Salm-Dyck, Cact. Hort. Dyck. 1844. 37. 1845.
Epiphyllum truncatum russellianum G. Don in Loudon, Encycl. Pl. ed. 3. 1378. 1855.
Schlumbergera epiphylloides Lemaire, Rev. Hort. IV. *7:* 253. 1858.

Epiphytic, growing on trees, rocks, or in humus, often found in dark crevices, 1 to 3 dm. long, either hanging or erect, much branched, divided into short joints; joints 1 to 2.5 cm. long; lower joints usually terete, covered with a brown epidermis; young joints green, flat, usually thin, with 1 or 2 small teeth on a side, 8 mm. broad or less, usually truncate at apex; areoles in axils of teeth, small, naked or bearing 1 or 2 bristles; flowers terminal, 4 to 5 cm. long, reddish purple; style slender, purple; ovary glabrous, sharply 4-angled, 1-celled; ovules numerous, arranged in 4 or 5 vertical double rows along walls of ovary; fruit described as red, 4-angled, or narrowly winded.

Type locality: Organ Mountains, Brazil.

Distribution: Brazil.

This plant was introduced into England in 1839. It was named by G. Gardner for the Duke of Bedford, who had sent him to Brazil to collect plants. The Duke of Bedford brought together at Woburn Abbey a very large and choice collection of cacti which became one of the finest in England. His gardener, Mr. James A. Forbes, published a catalogue of this collection in 1837.

Two varieties of this species are mentioned in horticultural works, namely, var. *rubra* and var. *superbum* under *Epiphyllum russellianum.*

Illustrations: Curtis's Bot. Mag. **66:** pl. 3717; Watson, Cact. Cult. 42. f. 9; Dict. Gard. Nicholson Suppl. 346. f. 370; Gartenflora **33:** pl. 1172; Förster, Handb. Cact. ed. 2. 873. f. 119; Rother, Praktischer Leitfaden Kakteen 106; Paxton's Mag. Bot. **10:** facing 245, as *Epiphyllum russellianum;* Hort. Univ. **1:** pl. 5, as *Cereus russellianus;* Rümpler, Sukkulenten 146. f 79, as *Phyllocactus russellianus;* Cycl. Amer. Hort. Bailey **2:** f. 766, as *Epiphyllum truncatum russellianum* (perhaps a hybrid); Contr. U. S. Nat. Herb. **16:** pl. 81.

SPECIES OF THIS RELATIONSHIP.

EPIPHYLLUM BRIDGESII Lemaire, Illustr. Hort. **8:** Misc. 5. 1861.

Epiphyllum truncatum bridgesii Rümpler in Förster, Handb. Cact. ed. 2. 870. 1885.

Epiphytic; joints green, flattened with 2 or more crenations on the side; areoles more or less setose, the setae yellowish brown; flowers terminal, 6 cm. long, nearly regular, purplish to crimson; perianth-segments oblong, acute; stamens long-exserted; style about as much exserted as stamens, purplish; ovary angled, angles sometimes bearing setose areoles.

Type locality: Not cited. Described from garden plants of unknown origin.

Distribution: Brazil or Bolivia or both.

This plant was described by Lemaire from a vegetative specimen seen in the collection of L. Desmet and from one in the collection of Schlumberger. He associated it with *Epiphyllum russellianum,* with which it must be allied, rather than with *E. truncatum,* to which it is referred as a synonym by the Index Kewensis.

Schlumberger had named the plant *Epiphyllum rueckerianum,* and here this name, often referred to in horticultural literature, should be referred.

It was briefly described by W. Watson (Gard. For. **2:** 243. 1889), who writes of its being awarded a first-class certificate at a flower show.

Schumann unfortunately describes the flower as zygomorphic, which may be an error; specimens recently sent to us from A. Berger have a regular flower. The ovary was originally described as angled and this is one of the differences between *Zygocactus* and *Schlumbergera.*

We do not know the origin of this plant. As it seems to have been introduced by Bridges it may have come from Bolivia, where he did much of his work.

This plant is sometimes called *Epiphyllum truncatum rueckerianum.*

Illustration: Dict. Hort. Bois 497, f. 347, as *Epiphyllum ruckerianum.*

4. EPIPHYLLUM (Hermann) Haworth, Syn. Pl. Succ. 197. 1812.

Phyllocactus Link, Handb. Erkenn. Gewächse *2:* 10. 1831.
Phyllocereus Miquel, Bull. Sci. Phys. Nat. Néel. 112. 1839.

Plants mostly epiphytic, the main stem often terete and woody; branches usually much flattened, often thin and leaf-like, sometimes 3-winged; areoles small, borne along the margins of the flattened branches; spines usually wanting in mature plants, but often represented in seedlings and juvenile forms by slender bristles; true leaves wanting; cotyledons rather large, sometimes persisting for a long time; flowers usually large, in some species nocturnal, in others diurnal, either odorless or very fragrant; flower-tube longer than the limb, in some species greatly elongated; filaments usually long, borne at top of tube or scattered over surface of throat; style elongated, white or colored; stigma-lobes several, linear; perianth soon dropping from the ovary; fruit globular or short-oblong to narrowly oblong, often with low ridges, sometimes tubercled, red or purple, edible or insipid, when mature splitting down one side and exposing the white or crimson pulpy interior; seeds black, shining.

Type species: *Cactus phyllanthus* Linnaeus.

The generic name is from the Greek, meaning upon, and from the Greek, meaning leaf, as it was supposed that the flowers were borne on leaves; it is a misnomer, for the flowers are not borne on leaves but on stems as in all other cacti.

In 1890 K. Schumann recognized 15 species; but, as a number of new ones were described soon afterward, he increased this number to 21 in his Keys of the Monograph published in 1903. In our treatment 16 species are recognized.

The name *Epiphyllum* is often used for a different group of cacti, that is, the crab cactus; the type species of *Epiphyllum* is, however, in the genus as we have here limited it. When Haworth publishd the genus he referred to it but one species, *Epiphyllum phyllanthus*, but he later added another species, *E. truncatum*, which, when it was found to belong to a different generic type, was erroneously allowed to retain the name *Epiphyllum*, while *Epiphyllum phyllanthus* became the type of the genus *Phyllocactus*, which, when first described in 1831, contained but a single species, so that *Epiphyllum* and *Phyllocactus* were based on the same type and *Phyllocactus* is a synonym of *Epiphyllum*. This is also true of *Phyllocereus*, which was based on the *Epiphyllum* of Haworth (Syn. Pl. Succ. 197. 1812), where only *E. phyllanthus* is described.

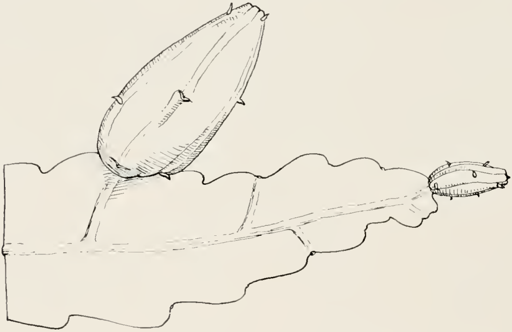


Fig. 194.—Top of fruiting branch of Epiphyllum phyllanthus. x 0.66.

The pre-Linnaean species of this genus were usually referred to *Cereus* and, for it, the section *Alati* in *Cereus* was proposed by De Candolle (Prodr. 3: 469. 1828). Linnaeus, however, referred the only species which he recognized to *Cactus*, and Philip Miller referred the same species to *Opuntia*, but neither have had many followers.

Haworth (Phil. Mag. 6: 108, 109. 1829) followed by Don (Hist. Dichl. Pl. 3: 170. 1834) divides the genus into two sections, the *Nocturna* and the *Diurna*.

Phyllarthus Nicker (Elam. 2: 85. 1790) is generally supposed to be a synonym of this group but the genus is not typified; the Index Kewensis refers it to *Cereus* (?); Dr. E. L. Greene (Leaflets 1: 52) says that it applied to *Phyllanthus* and *Opuntia* of earlier authors; the *Phyllanthus* here referred to was *Cactus phyllanthus* Linnaeus.

Hermann (Par. Botavus Prodr. Add. 2. 1689) first used the name *Epiphyllum* when he listed the name *Epiphyllum americanum.* Haworth credited the name also to Hermann in 1812 when he established the genus.

KEY TO SPECIES.

- A. Perianth-tube 7 to 9 times as long as the limb . . . . 1. *E. phyllanthus*
- AA. Perianth-tube 1½ to 3 times as long as the limb.
  - B. Ultimate joints acuminate.
    - Flowers 25 to 30 cm. long . . . . 2. *E. oxypetalum*
    - Flowers 10 to 15 cm. long.
      - Margins of joints crenate . . . . 3. *E. pumilum*
      - Margins of joints undulate . . . . 4. *E. caudatum*
  - BB. Ultimate joints acute, obtuse or rounded.
    - C. Joints deeply lobed.
      - Joints 2 to 7 cm. broad.
        - Lobes of joints spreading; outer perianth-segments lemon-yellow . . . 5. *E. darrahii*
        - Lobes of joints pointing forward; outer perianth-segments reddish yellow . . . 6. *E. anguliger*
      - Joints very large, up to 25 cm. broad . . . . 7. *E. grandilobum*
    - CC. Joints crenate or nearly entire.
      - D. Joints deeply crenate, thick; perianth-tube bearing foliaceous scales . . . . 8. *E. crenatum*
      - DD. Joints low-crenate to nearly entire; perianth-tube without foliaceous scales.
        - E. Sinui of the joint-margins very narrow; flowers up to 20 cm. broad; stamens yellow . . . . 9. *E. macopterum*
        - EE. Sinui of the joint-margins open; flowers 15 cm. wide or less; stamens not yellow.
          - Ovary and fruit bearing linear scales . . . . 10. *E. lepidocarpum*
          - Ovary and fruit without linear scales.
            - Flowers 10 to 13 cm. long . . . . 11. *E. pittieri*
            - Flowers 15 to 28 cm. long.
              - Flowers about 28 cm. long; style orange . . . . 12. *E. guatemalense*
              - Flowers 15 to 25 cm. long; style white or pink.
                - Joints very stiff . . . . 13. *E. strictum*
                - Joints flexible or moderately stiff.
                  - Joints very large, up to 1 meter long and 12 cm. wide . . . . . 14. *E. stenopetalum*
                  - Joints smaller, rarely ever 7 cm. wide.
                    - Joints shallowly crenate or subdentate; species of Costa Rica . . . . 15. *E. cartagense*
                    - Joints deeply crenate; species of Tobago, Trinidad, and Venezuela . . . . 16. *E. hookeri*

1. **Epiphyllum phyllanthus** (Linnaeus) Haworth, Syn. Pl. Succ. 197. 1812.

Cactus phyllanthus Linnaeus, Sp. Pl. 469. 1753.
Opuntia phyllanthus Miller, Gard. Dict. ed. 8. No. 9. 1768.
Cereus phyllanthus De Candolle, Prodr. *3:* 469. 1828.
Phyllocactus phyllanthus Link, Handb. Erkenn. Gewächse *2:* 11. 1831.
Rhipsalis macrocarpa Miquel, Bull. Sci. Phys. Nat. Néerl. *1838:* 49. 1838 (in most part).
Rhipsalis phyllanthus Schumann in Martius, Fl. Bras. 4^2: 298. 1890 (in part).
Hariota macrocarpa Kuntze, Rev. Gen. Pl. *1:* 263. 1891.
Phyllocactus phyllanthus paraguayensis Weber, Dict. Hort. Bois 957. 1898.
Phyllocactus phyllanthus boliviensis Weber, Dict. Hort. Bois 957. 1898.
Phyllocactus phyllanthus columbiensis Weber. Dict. Hort. Bois 957. 1898.
Epiphyllum gaillardae Britton and Rose, Contr. U. S. Nat. Herb. *16:* 240. 1913.
Phyllocactus gaillardae Vaupel, Monatsschr. Kakteenk. *23:* 87. 1913.

Elongated and much branched; main branches narrow, terete or 3 or 4-angled, woody; terminal joints elongated, terete or 3-angled below, usually flat or thin, rarely 3-winged, bright green with a purple margin, sometimes 7 cm. broad, obtuse, the margin coarsely serrate, the teeth obtuse; flower slender, 25 to 30 cm. long, the slender tube very much longer than the limb, green, the limb greenish or white, its segments narrow, 2 to 2.5 cm. long; scales on flower-tube few, minute, spreading; style long, slender, pinkish (Schumann says white); filaments short; stigma-lobes short, white; fruit oblong, 7 to 9 cm. long, somewhat 8-ribbed, bright red; pulp white; seeds large, black, numerous.

According to De Candolle, the flowers are nocturnal and odoriferous.

Type locality: Brazil.

Distribution: Panama to British Guiana, Bolivia, Peru, and Brazil. Recorded from Paraguay.

The species has been recorded from the West Indies, apparently erroneously.

Our description is based on field notes made by Dr. Rose in Brazil in 1915 which differ slightly from published descriptions. This plant is common in the woods along the coast of eastern Brazil, often growing in inaccessible places high up in the great trees. Open flowers were not seen, but buds, fruit, and seeds were obtained. Living plants were collected and these have done well; one flower appeared in the collection of the Department of Agriculture during Dr. Rose's absence in Ecuador in 1918. The caretaker, Mr. Fraile, describes the flower as long and slender and very unlike other species of *Epiphyllum,* of which he has seen many (Rose, No. 19627). It fruited in the New York Botanical Garden in 1920. The plant is called flor de baile or flower of the ball.

An *Epiphyllum* grows in the lowlands of Ecuador which we have tentatively referred here, although we have never seen its flowers or fruits. Dr. Rose collected it below Huigra, September 8, 1918 (No. 22614), and again above Santa Rosa near Limón Playo, October 17 (No. 23493).

Cactus phyllanthus of Linnaeus (Sp. Pl. 469. 1753) and *Epiphyllum, phyllanthus* Haworth (Syn. Pl. Succ. 197. 1812) both contain references not only to this species but to *Epiphyllum phyllanthoides* also.

The variety *columbiensis* was described by both Weber and Schumann with a flower-tube only 6 cm. long.

Cereus phyllanthus marginatus Parmentier is mentioned by Lemaire (Cact. Gen. Nov. Sp. 76. 1839) but not described.

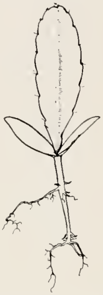


FIG. 195.—Seedling of Epiphyllum phyllanthus. x 0.6.

Illustrations: Contr. U. S. Nat. Herb. **16:** pl. 68, as *Epiphyllum gaillardae;* Pfeiffer and Otto, Abbild. Beschr. Cact. **1:** pl. 10, f. 1, as *Cereus phyllanthus;* Petiver, Gazoph. Dec. pl. 59, f. 10. 1709, as *Heliotropium,* etc.; Dillenius, Hort. Elth. pl. 64, as *Cereus scolopendrii, etc.; De* Candolle, Pl. Succ. Hist. pl. 145; Vellozo, Fl. Flum. **5:** pl. 33 (except flower), as *Cactus phyllanthus;* Monatsschr. Kakteenk. **2:** 73, as *Phyllocactus phyllanthus;* Martius, Fl. Bras. **4^2:** pl. 44.

Figure 194 is from a photograph of a fruiting branch borne on the specimens obtained by Dr. Rose in Brazil in 1915; figure 195 shows a seedling with its two large cotyledons, grown from seeds sent by Mrs. D. D. Gaillard from Panama.

2. Epiphyllum oxypetalum (De Candolle) Haworth, Phil. Mag. 6: 109. 1829.

Cereus oxypetalus De Candolle, Prodr. *3:* 470. 1828.
Cereus latifrons Pfeiffer, Enum. Cact. 125. 1837.
Phyllocactus oxypetalus Link in Walpers, Repert. Bot. *2:* 341. 1843.
Phyllocactus latifrons Link in Walpers, Repert. Bot. *2:* 341. 1843.
Phyllocactus grandis Lemaire, Fl. Serr. *3:* 255b. 1847.
Phyllocactus guyanensis Brongnart in Labouret, Monogr. Cact. 416. 1853.
Epiphyllum acuminatum Schumann in Martius, Fl. Bras. *4^2:* 222. 1890.
Phyllocactus acuminatus Schumann, Gesamtb. Kakteen 213. 1897.
Phyllocactus purpusii Weingart, Monatsschr. Kakteenk. *17:* 34. 1907.
Epiphyllum grande Britton and Rose, Contr. U. S. Nat. Herb. *16:* 257. 1913.

Plants stout, 3 meters long or more, much branched; branches flat and thin, 10 to 12 cm. broad, long-acuminate, deeply crenate; flowers opening in the evening, drooping and limp after anthesis, fragrant; tube of flower 13 to 15 cm. long, rather stout, red, about 1 cm. thick, bearing distant narrow scales about 10 mm. long; outer perianth-segments narrow, reddish to amber, 8 to 10 cm. long; inner perianth-segments oblong, white; stamens numerous, white; style white, thick, 20 cm. long; stigma-lobes numerous, cream-colored, entire.

Type locality: Mexico.

Distribution: Mexico and Guatemala, Venezula, and Brazil. Widely cultivated in the tropics and doubtless an escape in many places.

This species has long been cultivated and has always been a great favorite on account of the ease with which it is grown and the abundance of large flowers it furnishes. These begin to open in the early evening and are perfect about midnight.

According to Mr. Pittier, this plant is known as flor de baile in Venezuela.

Epiphyllum latifrons Zuccarini (Pfeiffer, Enum. Cact. 125. 1837) was given as a synonym of *Cereus latifrons* when that name was first published.

The name *Cactus oxypetalus* Mociño and Sessé was the first one given to this plant, but De Candolle (Prodr. **3:** 470. 1828) published the species as a *Cereus*, citing the above name as a synonym.

The following hybrids were listed by Labouret (Monogr. Cact. 429. 1853) between *Phyllocactus latifrons* and some other species of *Epiphyllum* or related genera; *Phyllocactus longipes, P. lothii, P. londonii, P. macquianus, P. maelenii, P. maurantianus, P. mexicanus, P. roseus albus, P. roseus superbus, P. selloi, P. smoli,* and *P. smithii.*

Illustrations: Monatsschr. Kakteenk. **17:** 35, as *Phyllocactus purpusii;* Meehans' Monthly **12:** 188, as *Epiphyllum latifrons;* Mém. Mus. Hist. Nat. Paris **17:** pl. 14, as *Cereus oxypetalus;* Förster, Handb. Cact. ed. 2. 849. f. 112, as *Phyllocactus oxypetalus;* Rother, Praktischer Leitfaden Kakteen 93; Monatsschr. Kakteenk. **20:** 123, as *Phyllocactus grandis;* Martius, Fl. Bras. 4^2: pl. 45, as *Epiphyllum acuminatum;* Engler and Prantl, Pflanzenfam. 3^{6a}: f. 59, D, as *Phyllocactus acuminatus;* Gard. Chron. **1849:** 788; Pfeiffer and Otto, Abbild. Beschr. Cact. **1:** pl. 10, f. 2, 3; Curtis's Bot. Mag. **67:** pl. 3813, as *Cereus latifrons;* Gartenwelt **10:** 560; Cact. Journ. **1:** 55; Goebel, Pflanz. Schild. **1:** pl. 2. f. 6; Schelle, Handb. Kakteenk. 209. f. 139; 210. f. 140, as *Phyllocactus latifrons.*

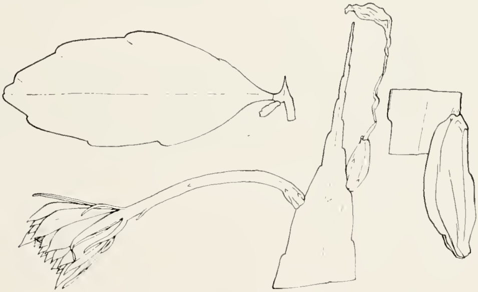


FIG. 196.—Epiphyllum pumilum. x 0.5.

3. **Epiphyllum pumilum** Britton and Rose, Contr. U. S. Nat. Herb. **16:** 258. 1913.

Phyllocactus pumilus Vaupel, Monatsschr. Kakteenk. *23:* 117. 1893.

At first erect or ascending but often becoming pendent, sometimes 5 meters long; main stems terete; branches of two types; some of them elongated, 8 to 15 dm. long, terete, whip-like, sometimes becoming flattened at tip; some broad and flattened, rarely 3-winged, except at base, usually acute or acuminate, 1 to 6 dm. long, 3 to 8.5 cm. broad, becoming thick when old, the margin remotely toothed; flowers small for the genus; tube 5 to 6 cm. long, greenish white to reddish, bearing a few very small ascending and appressed reddish scales; outer perianth-segments linear, greenish or reddish, acute; inner perianth-segments white, lanceolate, acuminate, 3 to 4 cm. long; stamens in two groups; style slender, white, oblong, 4 to 7 cm. long, 2 to 2.5 cm. in diameter; fruit brilliant cerise when ripe, 5 to 7-ridged, bearing a few very small reddish ascending scales; pulp of fruit white, edible, sweet; seeds minute, jet-black.

Type locality: Guatemala.

Distribution: Lowlands of Guatemala.

This species has frequently been collected in Guatemala and is usually called *Epiphyllum pittieri,* which it somewhat resembles in the size of the flower, but the style is always white.

The flowers are night-blooming and sweet-scented. The fruit is much sought after by the Guatemalan Indians, who call it pitahaya.

The above description is based on living specimens, full notes, and drawings, furnished by Harry Johnson, a very keen observer, at one time stationed in Guatemala.

Figure 196 is copied from pencil sketches made by Mr. Harry Johnson at Chamá, Alta Verapaz, Guatemala, in 1920.

4. **Epiphyllum caudatum** Britton and Rose, Contr. U. S. Nat. Herb. **16:** 256. 1913.

Phyllocactus caudatus Vaupel, Monatsschr. Kakteenk. *23:* 116. 1913.

Old stems terete and slender; lateral branches elongated-lanceolate, cuneately narrowed at base into a terete stalk, long-acuminate, 15 to 20 cm. long, 3 to 4 cm. wide, the margins low-undulate; flowers white, the tube slender, about 7 cm. long; inner perianth-segments about 6 cm. long; ovary and most of the flower-tube quite naked.

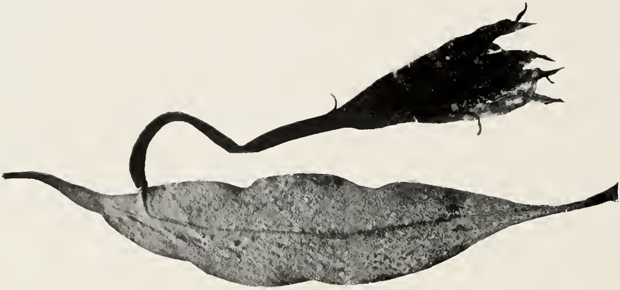


Fig. 197.—Epiphyllum caudatum.

Type locality: Near Comaltepec, Oaxaca, Mexico, altitude 540 to 900 meters.

Distribution: Known only from the type locality.

We have seen no specimens of this species except the type, but Dr. B. P. Reko, under date of June 28, 1919, wrote that he had seen the plant not only at Comaltepec, but at other places in the Sierra Juárez.

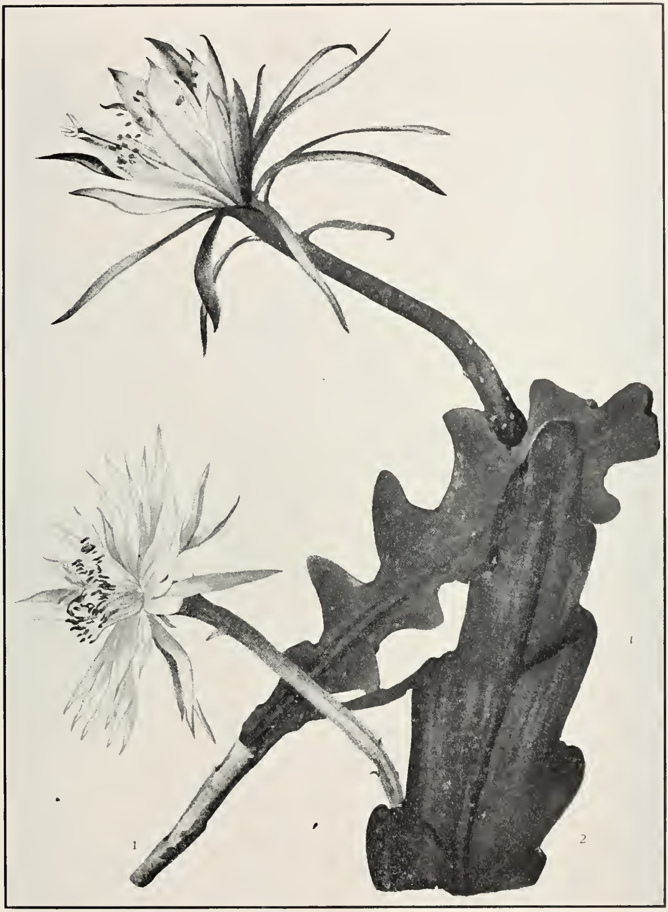
A plant sent from Chiapas, Mexico, by Dr. C. A. Purpus in 1920 has joints with simliar acuminate tips, but the margins are indented. We do not know its flowers.

Figure 197 is from a photograph of the type specimen.

5. **Epiphyllum darrahii** (Schumann) Britton and Rose, Contr. U. S. Nat. Herb. **16:** 256. 1913.

Phyllocactus darrahii Schumann, Gesamtb. Kakteen Nachtr. 69. 1903.

Stems much branched, often terete and woody below; joints rather thick, 2 to 3 dm. long, 3 to 5 cm. wide, deeply lobed, sometimes nearly to the midrib, the lobes usually obtuse; tube of flower 9 cm. long, somewhat curved, greenish; scales on tube and ovary small, linear, green, appressed; outer perianth-segments 10, linear, spreading or reflexed, acute, 4 cm. long, lemon-yellow; inner perianth-segments pure white, nearly as long as the outer, broader and more erect, short-acuminate; filaments white, nearly as long as the perianth-segments; style overtopping the stamens, pure white; stigma-lobes 8, linear.



1. Flowering plant of *Epiphyllum darrahii.*
2. Top of flowering plant of *Epiphyllum pittieri.*

(All three-fourths size.)

Type locality: Mexico.

Distribution: Mexico, but range unknown.

This species was named for Charles Darrah of Heaton Mersey near Manchester, England (1844-1903). His large and valuable collection of succulents, especially cacti, was presented to the Corporation of Manchester by his widow and family and is now housed in specially constructed houses in Alexander Park. In 1908 the late Robert Lamb published a catalogue of 129 pages of this collection.

The plant is cultivated in Mexico and is much prized as a potted plant for the patio; one of these was obtained by Dr. Rose in Ixmiquilpan in 1905 (No. 9091). Living specimens were sent home and these have repeatedly flowered in Washington and New York. It flowers abundantly, its blossoms giving off a most delicious honeysuckle-like fragrance; we have seen no specimens of wild plants.

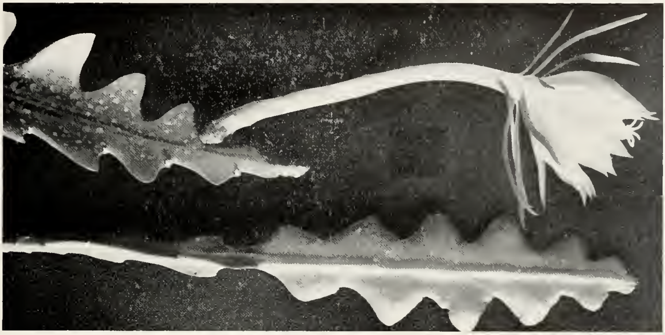


Fig. 198.—Epiphyllum darrahii.

Illustration: Blühende Kakteen **2**: pl. 91, as *Phyllocactus darrahii.*

Plate XVI, figure 1, shows the plant in flower, collected by Dr. Rose in Mexico in 1905, which flowered in the New York Botanical Garden in September 1917. Figure 198 is from a photograph of the plant collected by Dr. Rose at Ixmiquilpan, Mexico, in 1905 which afterwards flowered in Washington.

6. Epiphyllum anguliger (Lemaire) Don in Loudon, Encycl. Pl. ed. 3. 1380. 1855.

Phyllocactus anguliger Lemaire, Jard. Fleur. *1:* pl. 92. 1851.
Phyllocactus serratus Brongnart in Labouret, Monogr. Cact. 417. 1853.

Much branched; stems and lower branches terette; upper branches flattened with deeply toothed margins, rather fleshy; areoles small, usually felted and sometimes bearing 1 or 2 white bristles; flower-tube stout, without scales, about 8 cm. long; outer perianth-segments brownish yellow, inner perianth-segments white, oblong, acuminate, about 5 cm. long; style slender, white.

Type locality: Near Matanejo, Mexico.

Distribution: Central and southern Mexico.

We know the species only from cultivated plants. When not in flower it is difficult to distinguish it from *Epiphyllum darrahii.*

This plant was first distributed by the Horticultural Society of London, which obtained it from the collector, T. Hartweg, in 1846, from southern Mexico, where it was found growing on oak trees.

Phyllocactus angularis occurs in the index of Labouret's Monograph (511), credited to Lemaire, and also is listed in the Index Kewensis. It may have been a manuscript name for this species.

Illustrations: Lemaire, Jard. Fleur. **1:** pl. 92; Lindley and Paxton, Fl. Gard. **1:** pl. 34; Curtis's Bot. Mag. **85:** pl. 5100; Dict. Gard. Nicholson **3:** f. 134; Amer. Gard. **11:** 538; Möllers Deutsche Gärt. Zeit. **25:** 477. f. 11, No. 24; Cycl. Amer. Hort. Bailey **1:** f. 306; Palmer, Cult. Cact. 167; Watson, Cact. Cult. 48. f. 11. ed. 3. f. 9; Floralia **42:** 377, as *Phyllocactus anguliger.*

7. Epiphyllum grandilobum (Weber) Britton and Rose, Contr. U. S. Nat. Herb. **16:** 257. 1913.

Phyllocactus grandilobus Weber, Bull. Mus. Hist. Nat. Paris *8:* 464. 1902.

Branches bright green, very large, up to 25 cm. broad with the margins deeply lobed and with a thick midvein and obtuse or rounded apex; lobes rounded, 3 to 5 cm. long; flowers described as large, white, opening at night; fruit red without.

Type locality: La Hondura, Costa Rica.

Distribution: Costa Rica.

Weber speaks of this as a very remarkable species of which he had not seen flowers or fruit. His description was based on specimens collected by Wercklé in 1900 and also by Pittier in 1905.

Specimens of the type collection were obtained by Mr. Wm. R. Maxon from A. Brade in Costa Rica in 1906 (No. 13), but these have never flowered. In the New York Botanical Garden is a small specimen received from Wercklé in 1902 as *Epiphyllum grandilobum;* this shows one very deep lobe; a young joint shows shallow crenations and suggests *E. macropterum.* A plant of this relationship was collected by Mr. Pittier in Panama in 1911 (No. 4229) and is now growing in Washington, but has not flowered.

We believe that *Phyllocactus macrolobus* of Schumann's Keys belongs here, the specific name in error for *grandilobus.*

8. Epiphyllum crenatum (Lindley) G. Don in Loudon, Encycl. Pl. ed. 3. 1378. 1855.

Cereus crenatus Lindley in Edwards's Bot. Reg. *30:* pl. 31. 1844.
Phyllocactus crenatus * Lemaire, Hort. Univ. *6:* 87. 1845.
Phyllocactus caulorrhizus Lemaire, Jard. Fleur. *1:* Misc. 6. 1851.
Epiphyllum caulorhizum G. Don in Loudon, Encycl. Pl. ed. 3. 1380. 1855.

Old stems woody and terete; branches glaucous, often rooting at the tips, rather stiff, 2 to 3 cm. broad, obtuse, erect, at least at first, with large deep crenations, cuneate at base, the midrib thick; areoles at base of stem and branches often bearing hairs or small bristles; flowers very fragrant, rather large, the limb 10 to 12 cm. broad, cream-colored to greenish yellow, tube 10 to 12 cm. long, slender, bearing linear scales 2 to 3 cm. long; inner perianth-segments oblanceolate, 6 cm. long; filaments yellow; style white; stigma-lobes narrow; ovary scaly, some of the scales 2 cm. long, somewhat spreading.

Type locality: Honduras.

Distribution: Honduras and Guatemala.

This species has long been a favorite with gardeners, and many hybrids with it have been produced; the flowers, which are delicately fragrant, are diurnal and remain expanded for several days.

Among hybrids with other species are *Phyllocactus crenatus amaranthinus, P. elegans, erleri, haageanus, lateritius, roseus, splendens, superbus,* and *vogelii.*

Illustrations: Edwards's Bot. Reg. **30:** pl. 31, as *Cereus crenatus;* Blühende Kakteen **3:** pl. 180, as *Phyllocactus crenatus vogelii;* Gartenflora **40:** pl. 1347; Garten-Zeitung **4:** 182. f.

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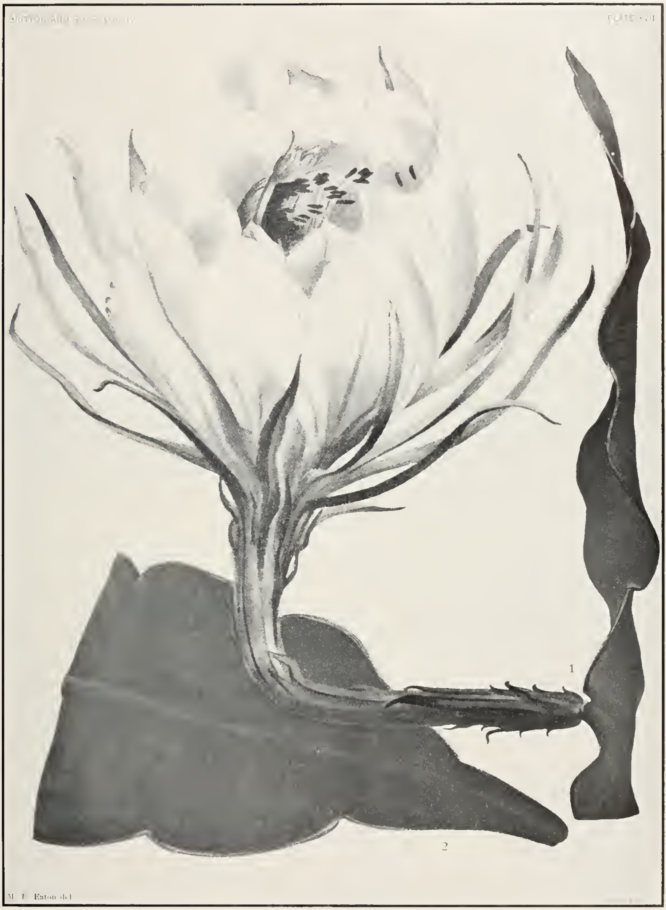
* The name was also published by Walpers in 1843 (Repert. Bot. 2. 820).



1. End of branch of *Epiphyllum macropterum*.
2. Base of branch of same.

(All three-fourths size.)

42, No. 4; Rother, Praktischer Leitfaden Kakteen 80, as *Phyllocactus crenatus;* Loudon, Encycl. Pl. ed. 3. 1379. f. 19401.

Figure 199 is from a photograph showing the base and tip of a branch of this species sent from Guatemala.

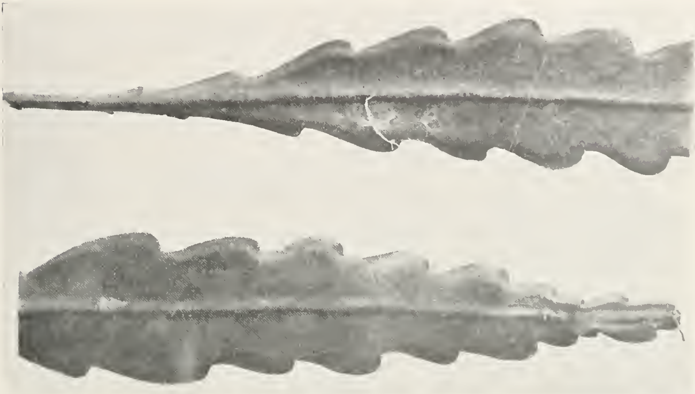


Fig. 199.—Epiphyllum crenatum.

9. Epiphyllum macropterum (Lemaire).

Phyllocactus macropterus Lemaire, Illustr. Hort. *11:* Misc. 73. 1864.
Phyllocactus thomasianus Schumann, Monatsschr. Kakteenk. *5:* 6. 1895.
Phyllocactus costaricensis Weber, Bull. Mus. Hist. Nat. Paris *8:* 463. 1902.
?*Phyllocactus macrocarpus* Weber, Bull. Mus. Hist. Nat. Paris *8:* 464. 1902.
Epiphyllum costaricense Britton and Rose, Contr. U. S. Nat. Herb. *16:* 256. 1913.
Epiphyllum thomasianum Britton and Rose, Contr. U. S. Nat. Herb. *16:* 259. 1913.

Plants up to 2 meters long, the joints weak, sometimes 10 cm. broad, thin, their margins horny; areoles distant (4 to 6 cm. apart) along the slightly indented margins; flower very large for genus, long, curved as in *Epiphyllum oxypetalum*; scales of ovary small, green, spreading, with long hairs in their axils; scales on tube longer (10 to 12 mm. long), less spreading but similar to those on ovary, acute; outer perianth-segments narrow, salmon-colored or with yellow tips, 10 cm. long; inner perianth-segments pure white, 8 to 9 cm. long, 2 to 3 cm. broad; tube of the flower 10 to 12 cm. long; throat 5 to 6 cm. long, funnelform, narrow below, 3 cm. broad at top; stamens lemon-yellow, slender, in 2 definite clusters, a single continuous row at top of throat, the second cluster scattered all over throat except for intervals of 2 cm. below upper one; style stout, 20 cm. long, pure white.

Type locality: Not cited.

Distribution: Costa Rica.

According to Mr. Fraile, the flower always comes out on the under side of the joint and lies appressed to it, instead of standing out free from it as in other species of the genus.

A vigorous plant in greenhouse cultivation but it flowers only sparingly.

Illustrations: Monatsschr. Kakteenk. **5:** pl. [1]; Blühende Kakteen **1:** pl. 41, as *Phyllocactus thomasianus.*

Plate xvii, figure 1, shows a branch of a plant sent by Dr. Wm. R. Maxon from San José, Costa Rica, which flowered in the New York Botanical Garden in 1912; figure 2 shows the base of the branch. Figure 200 is from a photograph showing the top and base of a joint.

10. Epiphyllum lepidocarpum (Weber) Britton and Rose, Contr. U. S. Nat. Herb. **16:** 257. 1913.

Pyllocactus lepidocarpus Weber, Bull. Mus. Hist. Nat. Paris *8:* 462. 1902.

Old and lower part of stems woody, cylindric; upper branches usually flattened, sometimes 3-winged, thickish, but not very stiff, 2 to 3 cm. wide; margins cut "stair-like," the areole closed by a small scale bearing in its axil short wool and a few bristles; flowers 20 cm. long, white and night-blooming; stamens in 2 rows; style white; fruit 9 cm. long by 4 cm. in diameter, violet-red, covered with long scales, at first erect, but finally becoming reflexed; flesh described as white,* acidulous, somewhat agreeable to the taste.

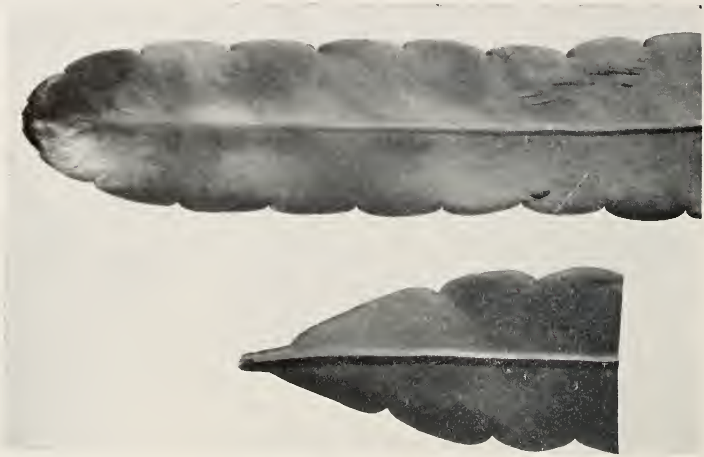


Fig. 200.—Epiphyllum macropterum.

Type locality: Near Cartago, Costa Rica.

Distribution: Known only from the type locality.

Our description is based on that of M. Weber. The very scaly fruit should be characteristic, but plants received from Costa Rica under the name *Phyllocactus lepidocarpus* produced smooth fruits at the New York Botanical Garden.

11. Epiphyllum pittieri (Weber) Britton and Rose, Contr. U. S. Nat. Herb. **16:** 258. 1913.

Phyllocactus pittieri Weber, Dict. Hort. Bois 957. 1898.

Stem usually terete below, much divided, 2 to 3 meters long; branches flat and thin, mostly 5 cm. wide or less, the margins coarsely toothed; flowers rather small, the tube about 8 cm. long, white to greenish white, bearing a few red, ascending scales; outer perianth-segments 4 to 4.5 cm. long, narrow, yellowish green, or some of the lower ones tinged with red, acute; inner perianth-segments white, a little shorter than the outer; stamens white, erect, in 2 series, longer than the style; style white above, red or purplish below; ovary with a few red scales; fruit dark red, 2 cm. long; seeds dull black.

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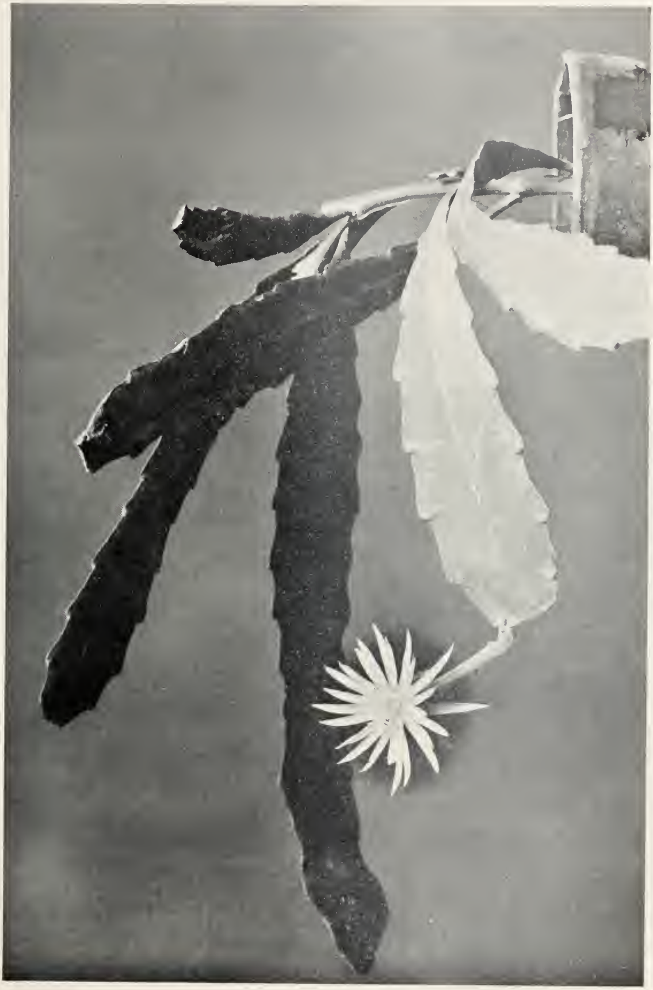
* Mr. Wercklé, who discovered this species, states in a letter (September 22, 1921) that the flesh is crimson.



Epiphyllum pittieri, from Costa Rica.

Type locality: Costa Rica.

Distribution: Costa Rica.

This species is an abundant bloomer, flowering in cultivation usually in January but also at other times of the year; its flowers are the smallest of the genus.

Plate XVI, figure 2, shows a flowering branch from the specimen sent by Mr. Pittier from Zent, Costa Rica, in 1904; plate XVIII shows another plant of the same collection which flowered in Washington.

12. Epiphyllum guatemalense Britton and Rose, Contr. U. S. Nat. Herb. **16:** 257. 1913.

Phyllocactus guatemalensis Vaupel, Monatsschr. Kakteenk. 23: 116. 1913.

Plant rather stout, in cultivation a meter long or longer; old stem woody, with gray bark, terete; branches green, flat, 4 to 8 cm. broad, narrowed at base and there terete, coarsely crenate, obtuse at apex; flower-bud pointed; flowers nocturnal, about 28 cm. long; tube about 15 cm. long, straight or nearly so, green or yellowish green, somewhat angled, at least below, bearing only a few red-tipped scales; inner central part of tube densely pilose; outer perianth-segments scale-like with red reflexed tips; inner pure white, narrow, 8 to 9 cm. long, acuminate; stamens borne on whole surface of rather short throat and therefore in more than one series; filaments pure white; style 25 cm. long, somewhat glossy, orange; stigma-lobes orange; ovary pale, bearing a few spreading scales.

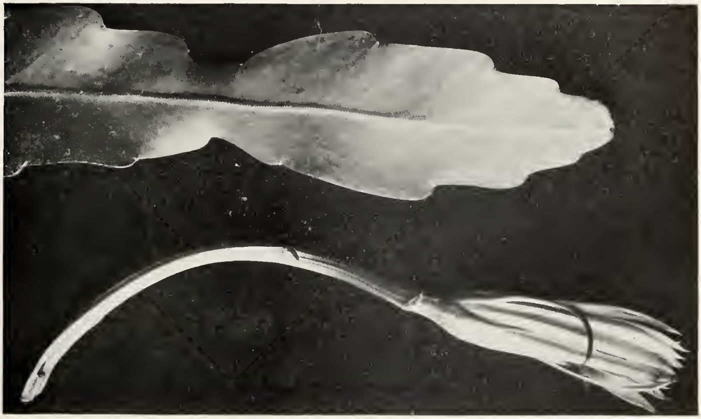


FIG. 201.—Epiphyllum guatemalense.

Type locality: Guatemala.

Distribution: Guatemala, but range unknown.

Two very distinct forms occur in this species which are hard to explain. They are so different that it seemed at first they must represent two distinct species, as they occur on separate plants. In one (it may be simply the juvenile form) the joints are rather thin and broad (5 to 8 cm. broad), the margins soft, with low broad undulations separated by a narrow, nearly closed sinus; in the other (it may perhaps be the adult form) the joints are stiff and narrow, the margins horny, the undulations with an open triangular sinus.

Illustration: Contr. U. S. Nat. Herb. **16:** pl. 78.

Figure 201 is from a photograph of the type plant.

13. **Epiphyllum strictum** (Lemaire) Britton and Rose, Contr. U. S. Nat. Herb. **16:** 259. 1913.

Phyllocactus strictus Lemaire, Illustr. Hort. *1:* Misc. 107. 1854.

Plant up to 2 meters long; joints linear, green, 5 to 8 cm. broad, coarsely serrate, stiff; tube of flower 13 to 15 cm. long, slender, green, bearing a few distant scales 8 to 12 mm. long; outer perianth-segments pink, the inner white, narrow, acuminate, 6 to 8 cm. long; filaments white; style pink or red; stigma-lobes yellow; fruit globose, 4 to 5 cm. in diameter; seeds black.

Type locality: Cuba, but the plant was grown there from seed.

Distribution: Southern Mexico and Guatemala to Panama.

The plant was found in the wild state in Honduras by Mr. Percy Wilson in 1902. All the other specimens studied by us are from cultivated plants. The species is common in collections.

Illustrations: Schumann, Gesamtb. Kakteen f. 41; Monatsschr. Kakteenk. **6:** 183; Thomas, Zimmerkultur Kakteen 18, as *Phyllocactus strictus.*

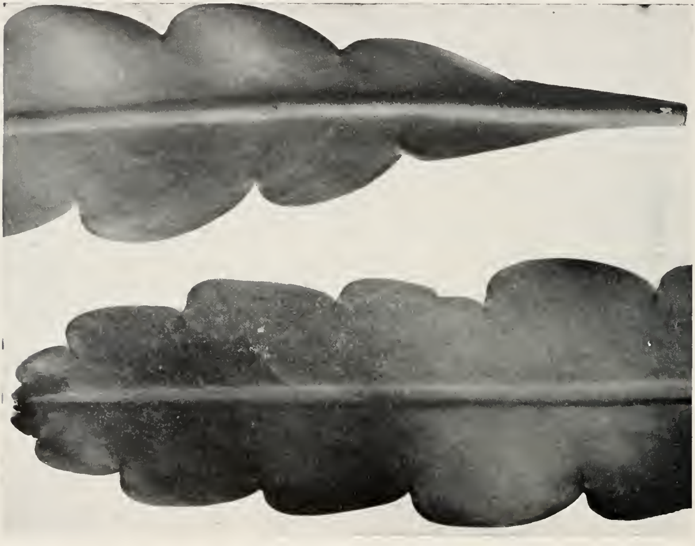


Fig. 202.—Epiphyllum stenopetalum.

14. **Epiphyllum stenopetalum** (Förster) Britton and Rose, Contr. U. S. Nat. Herb. **16:** 259. 1913.

Phyllocactus stenopetalus Förster, Handb. Cact. 441. 1846.

Described as with the habit of *Epiphyllum latifrons* but with different flowers, these delicately fragrant; flower-tube 12 to 15 cm. long, bearing small, spreading, rose-colored scales; outer perianth-segments rose-colored to reddish green; inner perianth-segments white, elongated, linear (7 to 8 cm. long, very narrow, 4 to 7 mm. broad), spreading or recurved; stamens somewhat exserted; style slender, pink or purplish; stigma-lobes 12 to 14, yellow; fruit unknown.

Type locality: Not cited.

Distribution: Oaxaca, Mexico.

This plant is a night-bloomer but the flowers are late in closing, sometimes remaining partially open as late as 9 o'clock in the morning.

The above description is compiled from that of Salm-Dyck with reference to a plant at the New York Botanical Garden, received from Paris in 1909.

It resembles *E. strictum* but the joints are more flexible and broader and it has somewhat larger flowers than that species; we have a herbarium specimen identified by Schumann which was collected by P. Sintenis from a cultivated plant grown in Porto Rico.

In 1911 C. Conzatti sent us from Coyula, Cuicatlán, Oaxaca, cuttings of what we now take to be this species. These grew into vigorous plants 3 meters long and flowered in Washington in 1921 and 1922.

Illustration: Goebel, Pflanz. Schild. **1:** f. 56, as *Phyllocactus stenopetalus* (seedling).

Figure 202 is from a photograph showing the top and base of a branch from Professor Conzatti's plant.

15. Epiphyllum cartagense (Weber) Britton and Rose, Contr. U. S. Nat. Herb. **16:** 256. 1913.

Phyllocactus cartagensis Weber, Bull. Mus. Hist. Nat. Paris *8:* 462. 1902.
Phyllocactus cartagensis refractus Weber, Bull. Mus. Hist. Nat. Paris *8:* 462. 1902.
Phyllocactus cartagensis robustus Weber, Monatsschr. Kakteenk. *15:* 180. 1905.

Plants 2 to 3 meters long, usually more or less flattened in the lower and older parts; joints short or elongated, 4 to 5 cm. broad, coarsely toothed or crenate, green; flowers opening at night, the slender tube 10 to 15 cm. long, reddish, bearing a few short distant scales; outer perianth-segments pink to yellowish; inner segments 5 to 7 cm. long, white; stamens in one series; filaments white; style pink to white; stigma-lobes yellow; fruit oblong, 7 to 8 cm. long, 3 cm. in diameter, red without, white within.

Type locality: Near Cartago, Costa Rica.

Distribution: Costa Rica.

A species apparently composed of several races, differing in margins of the joints, in size of flowers, and in color of style. It is called in Costa Rica platanillo de monte.

16. Epiphyllum hookeri Haworth, Phil. Mag. **6:** 108. 1829.

Cereus hookeri Link and Otto, Cat. Sem. Hort. Berol. 1828.
Cereus marginatus Salm-Dyck, Hort. Dyck. 340. 1834. Not De Candolle, 1828.
Phyllocactus hookeri Salm-Dyck, Cact. Hort. Dyck. 1841. 38. 1842.

Plants usually 2 to 3 meters long, but sometimes 7 meters long; joints 5 to 9 cm. broad, rather thin, light green, deeply crenate; flowers inodorous, the tube slender, 11 to 13 cm. long, greenish, bearing a few narrow, slightly spreading, rose-tipped scales; outer perianth-segments narrow, greenish pink, sometimes rose-colored at tip, the inner pure white, narrow, 5 cm. long; stamens in a single series, attached at top of throat; filaments white; style carmine, except yellowish base and pinkish top, smooth in upper half, papillose in lower half; stigma-lobes yellow; ovary green, somewhat angled, 2 cm. long, bearing a few small spreading scales; fruit oblong, 8 cm. long, red, somewhat angled, bearing a few scattered scales; seeds numerous, black, shining, reniform.

Type locality: Cited as Brazil, presumably in error.

Distribution: Tobago, Trinidad, and northern Venezuela.

This plant when it first flowered in cultivation in 1826 was taken for *Cactus phyllanthus* and was so figured and described in the Botanical Magazine, but it was soon discovered to be very different from that species.

While Brazil is cited as the type locality for this species we have seen no specimens from any point south of Venezuela. The plant is and has been widely cultivated in tropical America, commonly under the erroneous name, *Epiphyllum phyllanthus*. In Trinidad it forms great masses on trees and on coastal cliffs, ascending the trees to a length of 10 meters or more, branching profusely, and is very floriferous.

Phyllocactus marginatus Salm-Dyck (Cact. Hort. Dyck. 1844. 37. 1845) doubtless belongs here.

Illustrations: Pfeiffer and Otto, Abbild. Beschr. Cact. **1:** pl. 5, as *Cereus hookeri;* Curtis's Bot. Mag. **53:** pl. 2692; Loudon, Encycl. Pl. 413. f. 6901, as *Cactus phyllanthus;* Addisonia **5:** pl. 192.

Plate XIX shows a flowering branch from a specimen sent by W. E. Broadway from the Island of Tobago in 1909.

HYBRIDS.

EPIPHYLLUM ACKERMANNII Haworth, Phil. Mag. **6:** 109. 1829.

Cactus ackermannii Lindley in Edwards's Bot. Reg. *16:* pl. 1331. 1830.
Cereus ackermannii Otto in Pfeiffer, Enum. Cact. 123. 1837.
Phyllocactus ackermannii Salm-Dyck, Cact. Hort. Dyck. 1841. 38. 1842.

Branches weak, flat, and thin with crenate margins; areoles felted, often bristly or with weak spines, especially on the young growth; flowers day-blooming, very large, sometimes 1.5 to 2 dm. broad, crimson; inner perianth-segments oblong, acute; filaments long, weak, declined; style more or less declined, pinkish; stigma-lobes white; ovary more or less bristly.

Type locality: Mexico.

Distribution: Mexico.

This species was originally described as from Mexican plants sent to Haworth from Ackermann and, supposedly, from wild plants, but the general belief now is that the plant is of hybrid origin. The flowers are so much like those of *Heliocereus* that this genus probably furnished one of its parents (see Botanical Magazine, pl. 3598).

On the other hand, E. A. Goldman collected in Chiapas a series of specimens which seems to represent more than one species, but all the flowers are similar to those of *Epiphyllum ackermannii* and one of the specimens may represent the wild state of that species. The plants all have flat joints bearing clusters of spines in their areoles.

Many garden varieties and artificial hybrids have been obtained from this plant, some described under English and others under Latin names.

Illustrations: Edward's Bot. Reg. **16:** pl. 1331, as *Cactus ackermannii:* Curtis's Bot. Mag. **64:** pl. 3598, as *Cereus ackermannii:* Blühende Kakteen **1:** pl. 49; Cycl. Amer. Hort. Bailey **3:** f. 1773; Dict. Gard. Nicholson **3:** f. 133; Karsten, Deutsche Fl. 887. f. 501, No. 6; ed. 2. **2:** 456. f. 605, No. 6; Förster, Handb. Cact. ed. 2. 841. f. 111; Rümpler, Sukkulenten 149. f. 81; Watson, Cact. Cult. 47. f. 10; Rother, Praktischer Leitfaden Kakteen 97; ed. 3. f. 8; Amer. Gard. **11:** pl. opp. 445; Gartenflora **32:** 374, as *Phyllocactus ackermannii:* Loudon, Encycl. Pl. 1202. f. 17368; Encycl. Brittanica ed. 11. **4:** 926. f. 3, as *Phyllocactus:* Rev. Hort. **1861:** 226. f. 44; Stand. Cycl. Hort. Bailey **2:** f. 1402.

Cactus hybridus was described and illustrated by P. C. Van Géel (Sert. Bot. **1:** pl. **115. 1832**). He states that it is known in Great Britain as *C. ackermannii.*

EPIPHYLLUM HYBRIDUM Hortus in Pfeiffer, Enum. Cact. 121. 1837.

This was given as a synonym of *Cereus speciosissimus lateritius,* which is briefly mentioned in volume 2 (p. 128) of this work.

EPIPHYLLUM JENKENSONII G. Don, Gen. Hist. Dichl. Pl. **3:** 170. 1834.

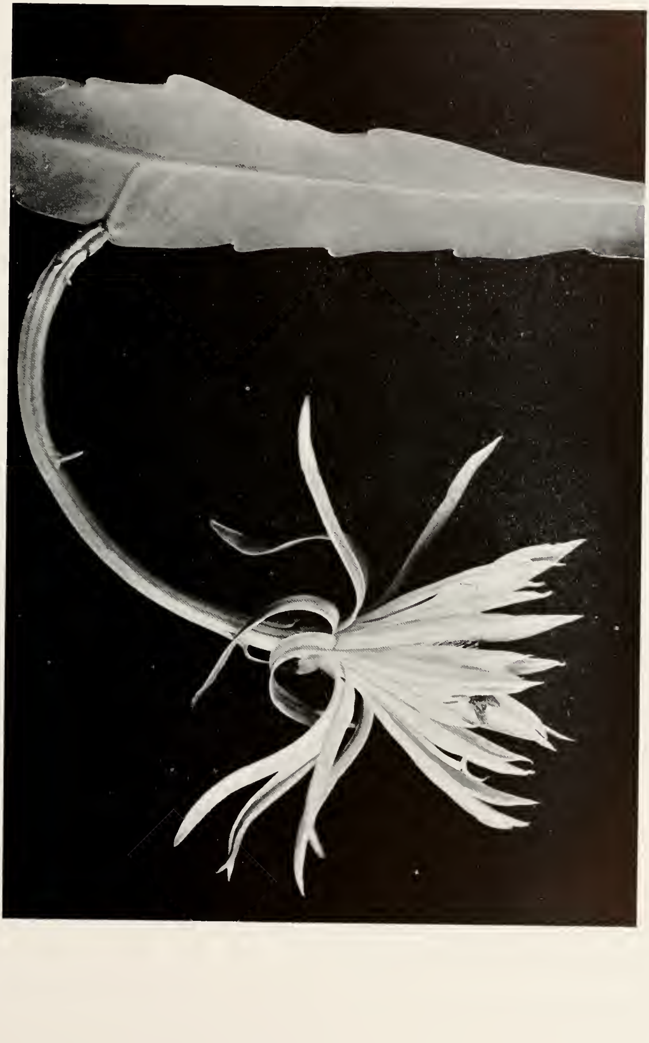
Epiphyllum speciosum jenkensonii G. Don in Loudon, Encycl. Pl. ed. 2. 1202. 1841.

This plant is an artificial hybrid raised from *Heliocereus speciosissimus,* impregnated by the pollen of *Epiphyllum phyllanthoides:* it has branches 3-angled at base but flattened above, with areoles very prominent and spiny; flowers large, 10 cm. broad and deep scarlet; fruit nearly globular, purple, 2.5 cm. in diameter, its areoles bearing a few spines and bristles. We have had it to flower and fruit in cultivation.

EPIPHYLLUM SPLENDIDUM Paxton, Mag. Bot. **1:** 49. 1834.

Cereus splendidus Steudel, Nom. ed. 2. *1:* 336. 1840.
Epiphyllum aitoni Steudel, Nom. ed. 2. *1:* 561. 1840.
Epiphyllum hitchenii Steudel, Nom. ed. 2. *1:* 561. 1840.

We know this plant only from a colored illustration (Paxton, Mag. Bot. 1: pl. facing 49). The flower is very large, 10 inches broad, red, tinged with orange; flower-tube much shorter than limb, and suggests a relationship with *Epiphyllum ackermannii.* Branches flat and strongly crenate. It is said to be



Epiphyllum hookeri, from Tobago, West Indies.

a native of Mexico, but probably is of hybrid origin. It is described as having one of the largest flowers among cacti, rivaling *Selenicereus grandiflorus* and *Heliocereus speciosus*.

Epiphyllum splendens Hortus (Ann. Fl. Pom. 343. 1839) is referred here by the Index Kewensis. It is, however, described on page 345 and illustrated on plate 44. This illustration is very different from that of Paxton.

PHYLLOCACTUS ALBUS GRANDIFLORUS.

Illustration: Cact. Journ. **1:** 37.

PHYLLOCACTUS ALBUS SUPERBUS.

Illustration: Blanc, Cacti 88, No. 2511.

PHYLLOCACTUS COOPERI Regel, Gartenflora 33: 218. 1884.

This is a hybrid between *Epiphyllum crenatum* and *Selenicereus grandiflorus*. It has large yellowish flowers.

Illustrations: Gartenflora **33:** pl. 1176, as *Phyllocactus crenato grandiflorus;* Cassell's Dict. Gard. **2:** 192.

PHYLLOCACTUS EREBUS.

This is a large red-flowered hybrid.

Illustration: Blühende Kakteen **3:** pl. 160.

PHYLLOCACTUS HAAGEI.

This is doubtless a garden hybrid related to *Epiphyllum ackermannii*. It has large flowers, 12.5 cm. broad, at first flesh-colored, becoming carmine.

Illustrations: Dict. Gard. Nicholson **4:** 590. f. 58; Watson, Cact. Cult. 54. f. 13.

PHYLLOCACTUS HIBRIDUS GORDONIANUS.

Illustration: Blühende Kakteen **1:** pl. 36.

PHYLLOCACTUS HIBRIDUS WRAYI.

This is said to be a cross between *Selenicereus grandiflorus* and *Epiphyllum crenatum*.

Illustration: Blühende Kakteen **2:** pl. 62.

PHYLLOCACTUS HILDMANNII.

Illustration: Gartenflora **44:** pl. 1421, f. 2.

PHYLLOCACTUS MARSUS.

Illustration: Dict. Gard. Nicholson Suppl. 598. f. 631.

PHYLLOCACTUS PFERSDORFFII.

Illustrations: Cact. Journ. **1:** 38; Rümpler, Sukkulenten f. 85; Schelle, Handb. Kakteenk. 221. f. 144.

PHYLLOCACTUS ROSEUS GRANDIFLORUS Watson, Cact. Cult. 55. 1889.

This was figured and described by Watson with flowers 15 cm. long and broad, nodding and white (!); doubtless of hybrid origin; it may be the same as *Phyllocactus roseus grandissimus* (Monatsschr. Kakteenk. **19:** 182. 1909).

Illustrations: Dict. Gard. Nicholson **4:** 591. f. 59; Förster, Handb. Cact. ed. 2. 857. f. 117; Watson, Cact. Cult. 55. f. 14.

PHYLLOCACTUS RUESTII Weingart, Monatsschr. Kakteenk. 24: 123. 1914.

We have not seen this plant and Mr. Weingart, who described it, says that he does not possess either living or herbarium material but that it is still growing at Halle, Germany.

PHYLLOCACTUS TRIUMPHANS.

Illustration: Monatsschr. Kakteenk. **20:** 3.

Epiphyllum speciosum lateritium Henslow (Loudon, Encycl. Pl. ed. 2. 1202. 1841), an English hybrid, produced in 1828, is described as having brick-colored flowers.

Phyllocactus tonduzii Weber is mentioned by Schumann (Monatsschr. Kakteenk. **10:** 127. 1900).

Phyllocactus tuna is a name used by Wercklé (Monatsschr. Kakteenk. **15:** 180. 1905) for a Costa Rican plant, without description.

Phyllocactus weingartii Berger (Monatsschr. Kakteenk. **30:** 33. 1920) is related to *Epiphyllum ackermannii.*

Charles Simon in 1893 published a list of 62 names of *Epiphyllum*, most of which are undoubtedly hybrids and some are referable to *Zygocactus*. The following binomials and trinomials are in the usual Latin form for specific and varietal names and are not recorded elsewhere:

album violaceum
amabile
aurantiacum
brasiliense
carminatum
cruentum
gracilis
grandiflorum
grande superbum
harrissoni
hercule
latetium album
maximum
multiflorum
palidum roseum
purpureum
roseum
rubrum violaceum
ruckerianum superbum
salmoneum marginatum
spectabile coccineum
translucens
tricolor
violaceum elegans
violaceum grandiflorum
violaceum rubrum
violaceum speciosum
violaceum superbum

There are many Latin names of *Phyllocactus* in catalogues, representing hybrids. We give below only those which have been used more or less in general botanical works, either as binomials or trinomials in regular Latin form:

acutifrons
agatha
alatus
albus superbiens
alexandrinae
amarantinus
arnoldi
aurantiacus superbus
belgicus
bergeri
bleindlii
boehmii
buestii
campmannii
caparti
capelleanus
carolus magnus
castneri
chico
coccineus
demouline
dolores
epirus
fuertii
germania
guentneri
hamburgiensis
hauffii
helenus
hempelii
hibridus
incomparabilis minuatus
jenkinsonii
kerthii
laarsenii
lorenzii
lunus
mexicanus *
purpureus
ruelcheri
speciosissimus feltonii
superbus
ulbrechtii
victoria-regia
vogelii
wippermannii
wrayi
zarka

In 1897 Charles Simon, of Saint-Ouen, Paris, published a list of 370 names of *Phyllocactus*, most of which were probably hybrids. The following binomials and trinomials are in the usual Latin form for specific and varietal names and are not recorded elsewhere:

ackermannii hybridus
ackermannii major
alatus major
albus grandidissimus
albus perfectus
albus superbissimus
amabilis
amabilis perfectus
atrosanguineus
aurantiacus
bergei
billiardieri
binderi
blindii
boliviensis
bollwillerianus
bothii
brongnarti
burmeisteri
colmariensis
colombiensis
courantii
crassuliefolius
crenatus amarantinus
crenatus caulorhizus
crenatus hirsutis
crenatus lateralis
crenatus latifolius
crenatus luteus
crenatus ruber
crispielsi
curtissi
dangeli
decumbens
deveauxi
dieffenbacchianus
dumoulini
edwarsii
elegans
erectus perfectus
erectus superbus
ernesti
erubescens
fastuosus
feasti
felonis
feltoni
floribundus
formosus
franzii
funkii
gloriosus
gordonianus
grandidissimus
grandiflorus
grandiflorus albiflorus
grandiflorus ruber
guebwillerianus
guedeneyi
hansii
havermansii
hitchensis
ignescens
jenkinsonii superbus
johnsonii
jordanis
kampmannii
kermesimus magnus
kiardi
kranzii
krausei
laetingii
laloyi
laudowi
leopoldii
lorentzii
ludmani
ludwigi
maigretii
magnificus
makoyi
mayanus
meyerianus
meuhlenpfordtii
mulhousianus
multiflorus
neubertii
niedtii
niger
nitens
nymphoea beata
paraguayensis
pentneri
phyllantoides
phyllantoides crenatus
potstachianus
poulletianus
pressleri

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* A hybrid referred by Index Kewensis to *Cereus mexicanus.*

pulcherrimus
quilliardetti
raveaudii
rebuti
reichei
reineckii
roseus carmineus
roseus carneus
roseus floribundus
roseus grandidissimus
roseus miniatus
roseus splendidus
roydii
ruber
ruber perfectus
ruber violaceus
sarniensis
schaffieri
schallerianus
schlimmi
schmidtii
sellowii
specillimus
speciosissimus
speciosissimus grandiflorus
speciosus roseus
splendens
splendidus
stenesi
superbissimus
tettani
tricolor
undiflorus
vandesii
vonhoffini
vitellinus
warscewiczii
wittmackianus

CACTUS ENSIFORMIS Biden, Gard. Chron, II. **20:** 53. 1883.

This is evidently some *Epiphyllum* hybrid. It was sent to H. B. Biden from Manchester, England, in 1883 and flowered the same year. Its flowers were described as 6 inches across, white, richly scented, and remaining open for 3 days.

Cactus speciosus grandiflorus (Monatsschr. Kakteenk. **14:** 11. 1904) is supposed to be some hybrid *Epiphyllum*.

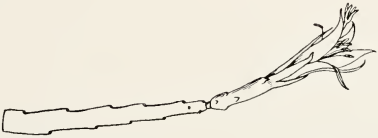


FIG. 203.—Tip of branch with flower of Disocactus biformis. x 0.8.

5. DISOCACTUS Lindley in Edwards's Bot. Reg. 31: pl. 9. 1845.

Disisocactus Kunze, Bot. Zeit. *3:* 533. 1845.

Irregularly branching, spineless epiphytes, the stem terete; branches numerous, flattened; areoles marginal; flowers diurnal, borne near tips of branches, nearly regular; tube shorter than limb; perianth-segments few, elongated, spreading; ovary small, cylindric, elongated, bearing a few minute scales; fruit globular to ovoid, not at all angled.

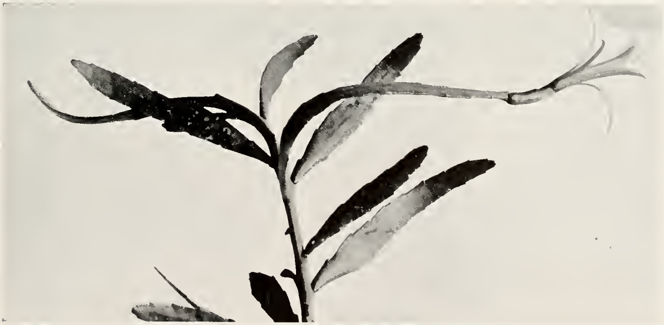


FIG. 204.—Disocactus biformis.

Type species: *Cereus biformis* Lindley.

We recognize two species, both from Central America.

The name is from the Greek, meaning twice, and from the Greek, meaning cactus, and was given because the perianth-segments of the inner and outer series were equal in the type specimens.

KEY TO SPECIES.

Slender with linear lateral branches, their margins slightly toothed; style and stamens about length of perianth-segments. . . . . 1. *D. biformis*
Spreading with oblanceolate lateral branches, their margins crenate; style and stamens long-exserted. . 2. *D. eichlamii*

1. Disocactus biformis Lindley in Edwards's Bot. Reg. 31: pl. 9. 1845.

Cereus biformis Lindley in Edwards's Bot. Reg. *29:* Misc. 51. 1843.
Disisocactus biformis Kunze, Bot. Zeit. *3:* 533. 1845.
Phyllocactus biformis Labouret, Monogr. Cact. 418. 1853.
Epiphyllum biforme G. Don in Loudon, Encycl. Pl. ed. 3. 1378. 1855.

Plant 2 dm. long or longer; branches linear, 5 to 8 cm. long, 1 to 2 cm. broad, with serrate margins; flower-bud elongated, curved upward, pointed; tube of the flower about 1 cm. long, the segments 8 (rarely 9), magenta, about 3 cm. long, the outer 4 or 5 spreading or curved backward, linear, the inner 3 or 4 broader and more erect; stamens 10 to 12, slightly exserted, borne in 2 series at top of tube; style slender, purple; stigma-lobes 4, white; ovary short-oblong, green, somewhat tubercled, with a few areoles subtended by small ovate scales; fruit ovoid, 1.5 cm. long, turgid, wine-colored.

Type locality: Honduras. The species described from a garden specimen, introduced into England in 1839.

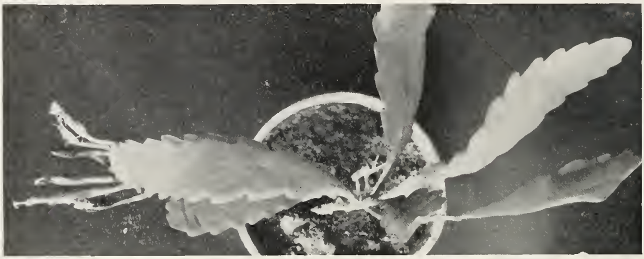


FIG. 205.—Disocactus eichlamii.

Distribution: Honduras and Guatemala.

We have had this plant under observation for a number of years. It is rather a shy bloomer with us, although we get one or two flowers each spring; the flowers open in the night or early morning and remain open all day; they begin to wither the second morning. The perianth-segments are more widely spreading in the morning than in the afternoon. The flower is almost horizontal and the tube proper is about the length of the ovary. The fruit matures very slowly. In 1920 we had a plant flower in April, but the fruit did not mature until July 8.

Illustrations: Förster, Handb. Cact. ed. 2. 876. f. 120; Rümpler, Sukkulenten f. 86, as *Disisocactus biformis;* Blühende Kakteen **1**: pl. 54; Curtis's Bot. Mag. **101**: pl. 6156; Dict. Gard. Nicholson **3**: f. 135; Monatsschr. Kakteenk. **9**: 141; Watson, Cact. Cult. 50. f. 12, as *Phyllocactus biformis;* Loudon, Encycl. Pl. ed. 3. 1379. f. 19403, as *Epiphyllum biforme;* Edwards's Bot. Reg. **31**: pl. 9; Palmer, Cult. Cact. 175.

Plate XXXII, figure 2, shows a branch of a fruiting plant sent to Dr. Rose by Robert Lamb of Manchester, England, in 1912. Figure 203 shows the flower of the same plant; figure 204 is from a photograph of the same plant in flower.

2. Disocactus eichlamii (Weingart) Britton and Rose, Contr. U. S. Nat. Herb. **16:** 259. 1913.

Phyllocactus eichlamii Weingart, Monatsschr. Kakteenk. *21:* 5. 1911.

Branching near the base; branches oblong, 2 to 3 dm. long, 3 to 5 cm. broad, cuneate at base, obtuse, thickish, strongly crenate; flowers several at the uppermost areoles, slender, 4 cm. long; stamens and style exserted; stigma-lobes 5; fruit red, 1 cm. in diameter with white pulp; seeds 1.5 mm. long.

Type locality: Guatemala.

Distribution: Guatemala.

This plant we know only from the collection of F. Eichlam; living specimens were sent to Washington by him which soon afterward flowered, but these have since died. Eichlam wrote that the flowers were a brilliant red. The species was named for Federico Eichlam, who lived in Guatemala at the time of his death in 1911.

Illustration: Contr. U. S. Nat. Herb. **16:** pl. 79.

Figure 205 is from a photograph of the type plant in flower.

6. CHIAPASIA gen. nov.

An epiphytic spineless cactus, the branches flattened, crenate, with slender terete bases, the large flowers borne at upper areoles; perianth narrowly campanulate; tube about half as long as limb, bearing a few small triangular scales; segments about 8, linear, recurved, spreading; ovary ovoid, shorter than tube, also with a few small scales; filaments about 20, not longer than perianth-segments; stigma-lobes few.

Type species: *Epiphyllum nelsonii* Britton and Rose.

A monotypic genus, its name taken from that of the Mexican state in which it grows.

1 **Chiapasia nelsonii** Britton and Rose.

Epiphyllum nelsonii Britton and Rose, Contr. U. S. Nat. Herb. *16:* 257. 1913.
Phyllocactus nelsonii Vaupel, Monatsschr. Kakteenk. *23:* 116. 1913.
Phyllocactus chiapensis J. A. Purpus, Monatsschr. Kakteenk. *28:* 118. 1918.

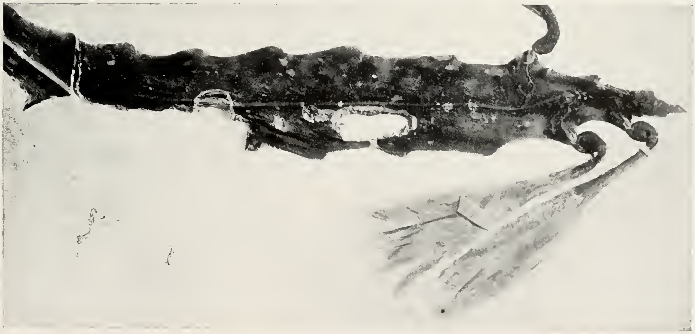


FIG. 206.—Chiapasia nelsonii.

Branches 6 to 12 dm. long, slender and terete below, flat and thin above, 3 to 4 cm. broad; margin low, crenate; flowers light rose-red; tube 2 to 3 cm. long; segments about 6 cm. long, narrow, acute.

Type locality: Near Chicharras, Chiapas, Mexico, altitude 900 to 1,800 meters.

Distribution: Known only from Chiapas.

Our first description of this plant was based on an herbarium specimen, but considerable additional information is now known regarding its habit. A very fine plant was grown at Darmstadt by J. A. Purpus, a photograph of which we have, showing that the main branches are long and terete while the lateral branches are broad and thin, often pendent, with 1 to 3 flowers near the end; the flowers are horizontal, with the perianth-segments more or less recurved; the stamens and style are slender and long-exserted.

Illustration: Monatsschr. Kakteenk. **28:** 119, as *Phyllocactus chiapensis.*

Figure 206 is from a photograph of the type specimen.

7. ECCREMOCACTUS Britton and Rose, Contr. U. S. Nat. Herb. 16: 261. 1913.

Plants epiphytic, pendent (erect or ascending in cultivation), several-jointed, the joints flat and thickish with spine-bearing marginal areoles or in cultivation often spineless; flowers solitary at upper areoles, funnelform, the short, nearly cylindric tube bearing small somewhat spreading scales, but no spines; perianth withering-persistent, its segments obtuse, rounded, or the innermost acutish; stamens and style white, included, slender, declinate; fruit carmine-red, oblong, with a few spineless areoles; seeds numerous, minute, black.

Type species: *Eccremocactus bradei* Britton and Rose.

Only one species is known, a native of Costa Rica. We have had the plant in cultivation for a number of years; it is a shy bloomer.

The generic name is from the Greek, meaning hanging from, and from the Greek, meaning cactus.

1. Eccremocactus bradei Britton and Rose, Contr. U. S. Nat. Herb. **16:** 262. 1913.

Phyllocactus bradei Vaupel, Monatsschr. Kakteenk. *23:* 118. 1913.

Epiphytic on trees; joints 15 to 30 cm. long, 5 to 10 cm. broad, light dull green, flat, but the central axis somewhat elevated on both sides, the margins shallowly crenate, with small spine-bearing areoles in the sinuses; spines solitary or in 2's or 3's, dark brown, 6 mm. long or less; flowers developing very slowly, 6 to 7 cm. long, slightly asymmetrical; outermost perianth-segments thick, shining, pinkish; outer ones oblong, thinner, pinkish white; inner perianth-segments oblong, obtuse, 3 to 3.5 cm. long; flower-tube 1 cm. long; throat broad, short, covered with stamens; filaments very slender, delicate, white, strongly declined; style slender, nearly white, slightly pinkish above, elongated, glabrous; stigma-lobes 8; ovary angled by the elongated tubercles; its areoles bearing a line of short hairs, subtended by thick ovate purple scales; seeds 1.5 mm. long.

Type locality: Cerro Turriwares, near Orotina (formerly Santo Domingo de San Mateo), Costa Rica.

Distribution: In dense forests at low altitudes, Costa Rica.

Our attention was first called to this plant by Dr. Maxon, who obtained specimens from Mr. Alfredo Brade in 1906; these bloomed in June 1911, but good flowers were not obtained. In 1913 Otón Jiménez sent specimens to Dr. Rose which flowered in 1918.

The flowers open in the night and are closed on the following morning. The branches of wild plants bear clusters of spines at the areole, but our cultivated plants are spineless and in the vegetative state resemble those of a turgid *Epiphyllum.* When the plant sent by Mr. Jiménez from Costa Rica (No. 905) flowered in 1921 seven flower-buds were produced from the seven uppermost areoles.

Illustration: Contr. U. S. Nat. Herb. **16:** pl. 83.

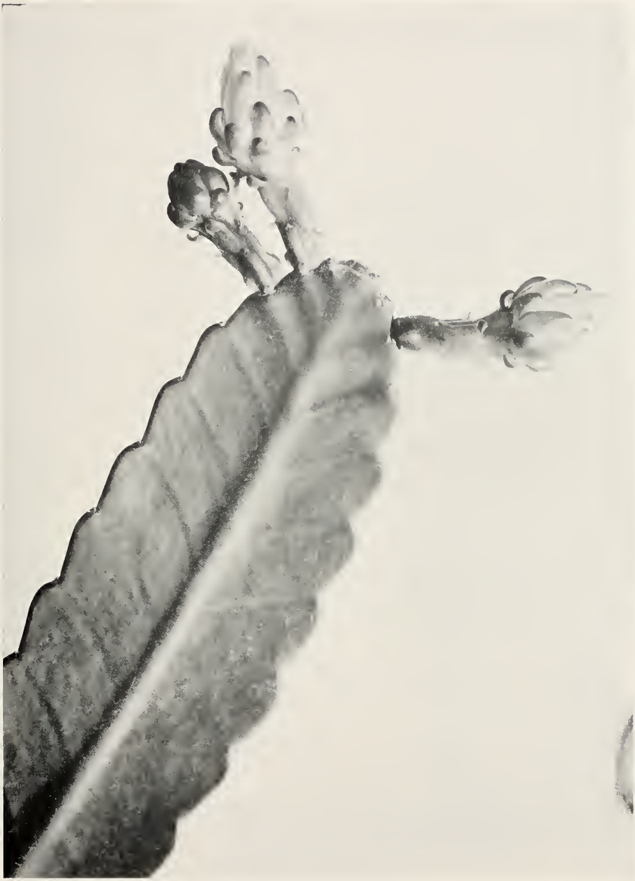
Plate XX is from a photograph of a plant sent to Washington by Otón Jiménez in 1913, which flowered in May 1921.

8. NOPALXOCHIA gen. nov.

A flat-jointed, spineless epiphytic cactus; joints crenate, the rather large, short-funnelform, rose or red flowers, solitary at lateral marginal areoles; flower-tube about as long as limb, bearing several narrow scales; outer perianth-segments short, acute, reflexed or spreading; inner spreading or connivent, acute; stamens numerous.

Type species: *Cactus phyllanthoides* De Candolle.

A monotypic Mexican genus, the name taken from the Aztec of Hernández.



Eccremocactus bradei, from Costa Rica.

1. Nopalxochia phyllanthoides (De Candolle).

Cactus phyllanthoides De Candolle, Cat. Hort. Monsp. 84. 1813.
Cactus speciosus Bonpland, Descr. Pl. Rar. Malm. 8. 1813. Not Cavanilles, 1803.
Epiphyllum speciosum Haworth, Suppl. Pl. Succ. 84. 1819.
Cactus elegans Link, Enum. *2:* 25. 1822.
Epiphyllum phyllanthoides Sweet, Hort. Brit. 172. 1826.
Cereus phyllanthoides De Candolle, Prodr. *3:* 469. 1828.
Phyllocactus phyllanthoides Link, Handb. Gewächs. *2:* 11. 1831.
Opuntia speciosa Steudel, Nom. ed. 2. *2:* 222. 1841.

Stems somewhat woody, branching, the branches terete at base, flattened and thin above, sometimes 5 cm. broad, green; margin of branches coarsely crenate; flowers diurnal, the tube 2 cm. long; inner perianth-segments oblong, more or less spreading; filaments and style elongated, slender; stigma-lobes 5 to 7.

Type locality: Mexico.

Distribution: Mexico or Colombia, but known only from cultivated plants.

The distribution of this species is assigned to Mexico, but both Edwards and Sims state definitely that it was first observed by Humboldt and Bonpland near the village of Turbaco, which is a few leagues south of Cartagena, Colombia. From seeds collected at that time, plants were grown in the garden of La Malmaison; one of these flowered in 1811 and was described and illustrated as *Cactus speciosus* in 1813.

This is one of the oldest known species of cacti; it was figured by Hernández in 1651 and by Plukenet in 1691. It has long been in cultivation, perhaps in prehistoric times.

It is often hybridized with other species. The following hybrids with it are given: *Phyllocactus phyllanthoides albiflorus, striatus, striatus multiflorus.*

Salm-Dyck (Hort. Dyck. 65. 1834) lists four varieties as follows: *Cereus phyllanthoides curtisii, C. phyllanthoides guillardieri, C. phyllanthoides jenkinsonii,* and *C. phyllanthoides vandesii.* Pfeiffer (Enum. Cact. 124. 1837) also mentions *Cereus phyllanthoides albiflorus.*

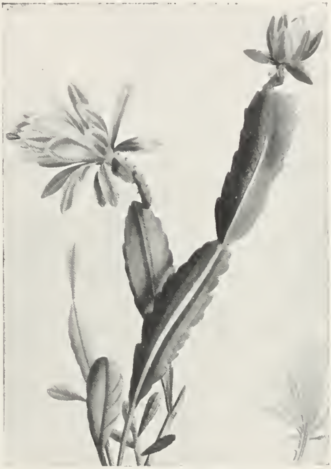


FIG. 207.—Nopalxochia phyllanthoides.

Epiphyllum vandesii Don (Gen. Hist. Dichl. Pl. **3:** 170. 1834) is a hybrid produced by placing the pollen of *Epiphyllum phyllanthoides* on the stigmas of *Heliocereus elegantissimus.*

Illustrations: Plukenet, Phyt. pl. 247, f. 5, as *Phillanthos;* Loudon, Encycl. Pl. 413. f. 6902; Curtis's Bot. Mag. **46:** pl. 2092, as *Cactus phyllanthoides;* Schumann, Gesamtb. Kakteen 217. f. 42; Monatsschr. Kakteenk. **7:** 87; Wiener Ill. Gart. Zeit. **28:** f. 39; Gartenwelt **4:** 560; **5:** 6 and pl. facing 6; Ann. Rep. Smiths. Inst. **1908:** f. 24; Möllers Deutsche Gärt. Zeit. **11:** 61; Goebel, Pflanz. Schild. **1:** f. 13, 52, 54, as *Phyllocactus phyllanthoides;* Bonpland, Descr. Pl. Rar. pl. 3; Edwards's Bot. Reg. **4:** pl. 304; Herb. Génér. Amat. **4:** pl. 244, as *Cactus speciosus;* Loudon, Encycl. Pl. ed. 2. 1202. f. 17367, as *Epiphyllum speciosum;* Pfeiffer, Abbild. Beschr. Cact. **2:** pl. 17, as *Cereus phyllanthoides* var. *stricta;* Ann. Inst. Roy. Hort. Fromont **2:** pl. 1, f. E, as *E. phyllanthoides;* Hort. Ripul. pl. 10; Van Géel, Sert. Bot. pl. 111, as *Cactus alatus.*

Figure 207 is a reproduction of Bonpland's illustration as *Cactus speciosus.*

9. WITTIA Schumann, Monatsschr. Kakteenk. 13: 117. 1903.

Epiphytic, branching cacti, pendent from trees and rocks; joints elongated, flattened or somewhat thickened, spineless, the margins more or less crenate; flowers small for this group, not fugacious, with a definite tube, much longer than limb; perianth-segments short, erect; style (so far as known) slender, white, a little exserted; fruit small, berry-like.

Type species: *Wittia amazonica* Schumann.

In vegetative characters this genus is similar to some of the *Rhipsalidanae*, but the flower has a tube longer than the limb.

The genus is named for N. H. Witt, who made valuable collections in Brazil.

We recognize two species, natives of Panama and northern South America.

Key to Species.

Fruit roughened by small tubercles	1. *W. amazonica*
Fruit smooth	2. *W. panamensis*

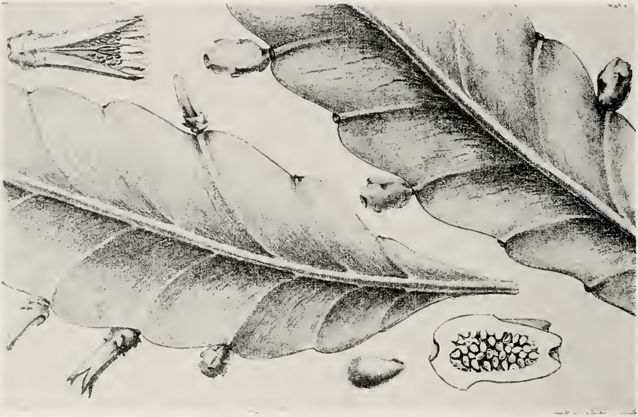


Fig. 208.—Wittia amazonica.

1. Wittia amazonica Schumann, Monatsschr. Kakteenk. 13: 117. 1903.

Branches flattened except at base, 15 to 40 cm. long, 4.5 to 9 cm. broad, often with constrictions, cuneate at base, coarsely crenate, obtuse or acute at apex; flowers 2.5 cm. long; perianth wine-colored, 2 cm. long, cylindric, somewhat curved; perianth-segments 10, erect, in 2 series; stamens included, in 2 series; style 18 mm. long, stigma-lobes 5; ovary strongly tuberculate; scales on ovary 3-angled; fruit 12 to 17 mm. long, deeply umbilicate at apex.

Type locality: Near Laeticia and Tarapoto, Peru.

Distribution: Northeastern Peru, not far from the Brazilian border.

We know the plant from description and illustration only.

Illustration: Monatsschr. Kakteenk. 13: 119.

Figure 208 is reproduced from the illustration cited above.

2. Wittia panamensis Britton and Rose, Contr. U. S. Nat. Herb. **16:** 241. 1913.

Branches much flattened, up to 1 meter long, 4 to 7 cm. wide, low-crenate; flowers sometimes 15 or more on a branch but solitary at areoles on upper half of joint, purple, becoming straight, 2.5 to 3.5 cm. long, 5-angled, stiff; outer perianth-segments 10, in 2 series, equal, obtuse; outermost ones angled on back; inner perianth-segments 5, similar to outer but thinner, not angled or only slightly so, a little longer, all erect; innermost segments 10 or 11, thinner, paler, and much smaller than outer, apiculate, sometimes toothed above; tube proper 5 to 6 mm. long, the throat 10 mm. long; stamens many, in 2 series, one on base of throat on long filaments, one on top of throat on short filaments, all included; stigma-lobes 4, white, but remaining in a close cluster, the top exserted beyond perianth-segments; ovary globular, purple, bearing a few scarious scales.

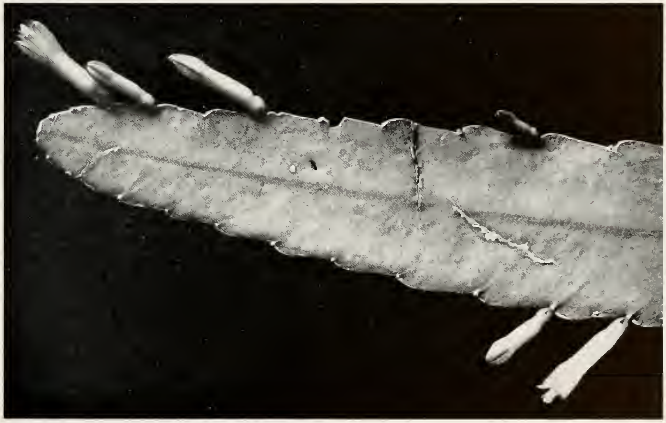
Type locality: Mountains above Chepo, Panama.

Distribution: Panama, Colombia, and perhaps Venezuela.

Mr. Henri Pittier has collected in Venezuela a plant which is closely related to this species (No. 7656).

Illustrations: Contr. U. S. Nat. Herb. **16:** pl. 73; Curtis's Bot. Mag. **145:** pl. 8799.

Figure 209, shown below, is from a photograph showing the plant collected by Mr. Pittier in 1912 which afterwards flowered in Washington.



Subtribe 8. RHIPSALIDANAE.

Mostly epiphytic cacti, generally growing on trees but sometimes clambering over rocks or pendent from them, much branched; branches alternate or often in whorls, slender, terete, angled or flat and thin, spineless, except in *Pfeiffera* and *Acanthorhipsalis;* flowers regular, mostly small, rotate, and without any tube or with a very short tube; stamens usually few, attached to disk or near base of flower-tube; style usually short; fruit a small juicy berry, white, red, or purple; seeds minute.

We have placed this subtribe at the end of our monograph because it appears to us to represent the most extreme differentiation within the family. It is indeed difficult to explain to most people that its species are really cacti.

We recognize eight closely related genera.

KEY TO GENERA.

Flowers with a short definite tube.
  Joints terete .... 1. *Erythrorhipsalis* (p. 208)
  Joints flattened, ribbed, or angled.
    Joints and flowers terminal .... 2. *Rhipsalidopsis* (p. 209)
    Joints and flowers normally lateral.
      Joints with spiny areoles; ovary and fruit with areoles subtended by scales.
        Joints ribbed; fruit-areoles spiny .... 3. *Pfeiffera* (p. 210)
        Joints flattened or 3-winged; fruit-areoles not spiny .... 4. *Acanthorhipsalis* (p.211)
      Joints not spiny; fruit mostly without areoles.
        Upper joints normally flattened; areoles not pilose .... 5. *Pseudorhipsalis* (p. 213)
        Upper joints flattened or 3-angled; areoles long-pilose .... 6. *Lepismium* (p. 215)
Flowers without tube.
  Petals erect; ends of same joint unlike; flowers and branches always terminal .... 7. *Hatiora* (p. 216)
  Petals usually widely spreading; ends of same joint usually similar; flowers and branches lateral or terminal .... 8. *Rhipsalis* (p. 219)

1. ERYTHRORHIPSALIS Berger, Monatsschr. Kakteenk. 30: 4. 1920.

Epiphytic, with slender terete stem and branches, often pendent; branches dichotomous or sometimes in whorls of 3 to 6; areoles scattered, small, all bearing several bristles; flowers terminal, regular, diurnal, white to rose-colored with a short but definite tube; ovary and fruit bristly, the latter red; seeds much larger than in *Rhipsalis*.

Type species: *Rhipsalis pilocarpa* Löfgren.

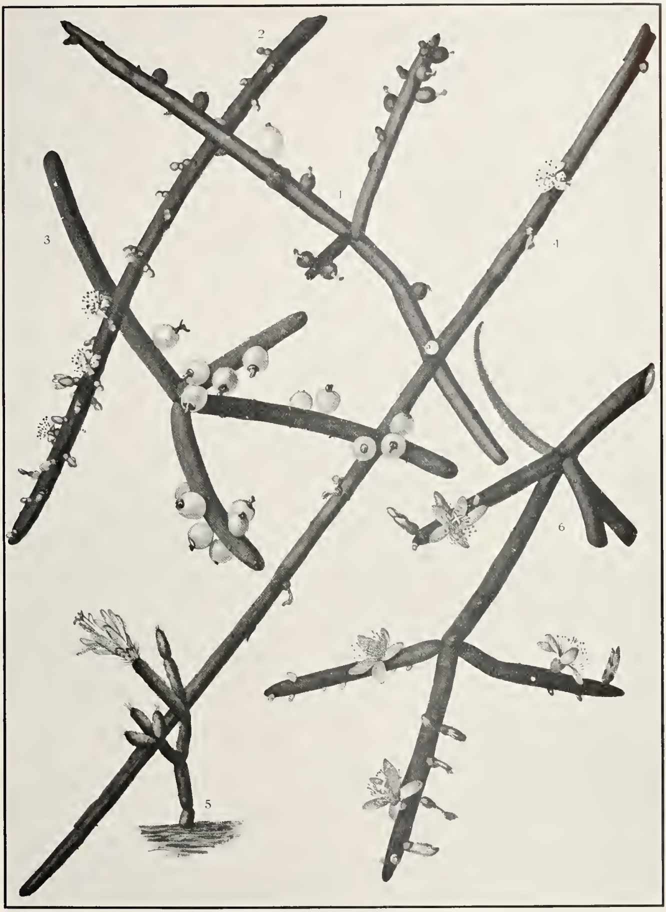
The generic name is from the Greek, meaning red, and *Rhipsalis*, referring to the red fruit and to the resemblance of this genus to *Rhipsalis*. Only one species is known.

The genus resembles in habit some of the species of *Rhipsalis* with round stems but has a distinct flower-tube, on the top of which the stamens are borne. It also differs from *Rhipsalis* in having a long exserted style, exserted even in the bud; in its slowly opening flower (requiring several days to expand); in its very fragrant flower; in having its ovary and fruit bearing areoles, each with a cluster of bristles; and in its larger seeds.

Löfgren, when he described *Rhipsalis pilocarpa*, was inclined to think that it might belong to *Pfeiffera*. In his latest treatment of it (Arch. Jard. Bot. Rio de Janeiro 1: 68) he referred it and *Pfeiffera ianthothele* to *Rhipsalis* under the subgenus *Pfeiffera*.

At the place cited above, Berger proposed that *Rhipsalis pilocarpa* should be regarded as a new subgenus of *Rhipsalis* but at the same time he incidentally made it the type of a new genus. Mr. Berger, who has written most interestingly of it, says in part:

> "In 1903, Löfgren made known *Rhipsalis pilocarpa* (Monatsschr. Kakteenk. 13: 52 to 57) which formerly had a fairly wide distribution in our collections. I received it from various sources, the finest specimens coming from the Botanic Garden in Bremen, from which place it was sent for naming. The plant grew well in my hothouse but appeared to prefer it cooler and sunnier. The habit picture in the Monatsschrift, above cited, is not exactly right. The plant is striking because of its beautiful bristles; it is very odd. In general it does not differ from the rest of the species of *Rhipsalis*. Because of its beautiful bristles one is persuaded to put it into *Ophiorhipsalis*. Meantime the habit, the flowers, and the fruit show themselves to be a fundamental obstacle.
>
> "In all the species of *Rhipsalis* which I have had experience with, the ovary and later the fruit are entirely naked; at the most there is at times a little scale. In these plants, however, the ovaries which in form remind one of those of *Cereus*, bear a mass of small tubercles with little scales, in whose axils are a large



1. Fruiting branch of *Rhipsalis grandiflora.*
2. Flowering branch of *Rhipsalis lindbergiana.*
3. Fruiting branch of *Rhipsalis shaferi.*
4. Flowering and fruiting branch of *Rhipsalis lindbergiana.*
5. Flowering plant of *Erythrorhipsalis pilocarpa.*
6. Flowering branch of *Rhipsalis grandiflora.*

(All three-fourths size.)

number of projecting white bristles. Still more different is the fruit, which Löfgren did not know. It is striking because of its size, about 10 to 12 mm. by 10 to 12 mm., and while the rest of the *Rhipsalis* fruits in size, form, and color resemble mistletoe berries or are rarely yellow or pale rose, these are strongly wine-red and beset with numerous bristles bearing small areoles, forming a wreath on the umbilicus of the fruit, like *Cereus* and especially *Opuntia,* only the bristles are white and not pricking. In cross-sections the fruit is also red but has a watery sap and a large number of seeds, coiled on the placenta in the middle of the fruit. The seeds are about double the size of those of *Rhipsalis*."

1. **Erythrorhipsalis pilocarpa** (Löfgren) Berger, Monatsschr. Kakteenk. 30: 4. 1920.

Rhipsalis pilocarpa Löfgren, Monatsschr. Kakteenk. *13:* 52. 1903.

Stems dark green to purple, at first erect, sometimes 4 dm. long and unbranched, terminated by 2 to 4 branches in a whorl, the ultimate branches often only 1 cm. long, in time the whole plant becoming pendent; joints clustered, when withering somewhat angled, tipped by yellow bristles; areoles filled with long setose hairs or bristles subtended by ovate scarious bracts; flowers at ends of terminal branches, very fragrant, opening slowly, up to 2 cm. broad; flower-tube 2 mm. long, reddish on the inside; outer perianth-segments 5 or 6, triangular, rose-colored; inner perianth-segments 10 to 15, spreading or sometimes recurved, lanceolate, acuminate, 10 mm. long, white or cream-colored with pinkish tips; stamens numerous, red at bases; ovary with several areoles, bearing as many as 10 bristles, subtended by small scarious scales and surrounded by purple spots; style exserted in the bud; stigma-lobes 4 to 8, white, spreading apart the second day after the appearance of the style and before the stamens appear.

Type locality: Ytu and Ypanema, Sao Paulo, Brazil.

Distribution: States of Sao Paulo and Rio de Janeiro, Brazil.

Pfeiffera rhipsaloides Löfgren (Monatsschr. Kakteenk. **13:** 54. 1903) was another name suggested for this plant when it was first described.

Illustrations: Blühende Kakteen **2:** pl. 99; Monatsschr. Kakteenk. **13:** 55; Rev. Centr. Sci. Campinas No. 4, opp. 188; Möllers Deutsche Gärt. Zeit. **25:** 477. f. 11, No. 11, 20; Arch. Jard. Bot. Rio de Janeiro **1:** pl. 1, as *Rhipsalis pilocarpa.*

Plate XXI, figure 5, is of a plant in the New York Botanical Garden which flowered in April 1919 and was obtained by Dr. Shafer from Dr. Löfgren at Rio de Janeiro in 1917.

2. **RHIPSALIDOPSIS** gen. nov.

Somewhat shrubby, erect, reclining or pendulous, the joints 3 to 5-angled; branches usually several, terminal; areoles small, sometimes bearing setae; flowers terminal, with a broad rotate limb and a very short tube; stamens erect; style slender; fruit unknown.

Type species: *Rhipsalis rosea* Lagerheim.

One species is known, native of southern Brazil.

This plant was originally described as *Rhipsalis,* but it has a much larger flower and the perianth-segments are united into a short tube. In habit it resembles some of the species of *Epiphyllanthus* but has a regular flower. We have placed it near *Pfeiffera,* but we do not believe that it is close to that genus, for it has a rotate flower and the flowers and branches are terminal, as in *Zygocactus.*

The generic name is given on account of its resemblance to some of the species of *Rhipsalis.*

1. **Rhipsalidopsis rosea** (Lagerheim).

Rhipsalis rosea Lagerheim, Svensk Bot. Tidskr. *6:* 717. 1912.

Branches short, 1 to 3, strongly 4-angled or sometimes 3 or 5-angled, with concave sides; buds red; flowers 3.7 cm. broad, fragrant; perianth-segments few, rose-colored; stamens 11 mm. long, rose-colored; style 13 mm. long, rose-colored; stigma-lobes 3, white, 3 mm. long.

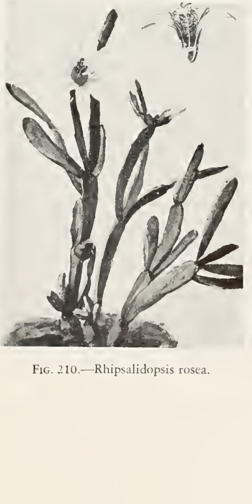


FIG. 210.—Rhipsalidopsis rosea.

Type locality: Woods near Caiguava, state of Parana, Brazil, altitude 1,100 to 1,300 meters.

Distribution: Southern Brazil.

Illustrations: Svensk Bot. Tidskr. **6:** pl. 28; Arch. Jard. Bot. Rio de Janeiro **2:** pl. 14, 15; Monatsschr. Kakteenk. **32:** 121, as *Rhipsalis rosea.*

Figure 210 is reproduced from the first illustration above cited.

3. **PFEIFFERA** Salm-Dyck, Cact. Hort. Dyck. 1844. 40. 1845.

Epiphytic, with a woody base; branches in wild state hanging, mostly 4-angled, not emitting aerial roots; spines several, acicular; flowers regular, diurnal, pale yellow to rose-colored (sometimes described as purple-red), small, the segments united at base into a very short tube; stamens included, some borne on flower-tube and some on disk; ovary and fruit spiny; seeds black, oblong.

Type species: *Cereus ianthothele* Monville.

Only one species is known, and this was first described as a *Cereus* and afterwards referred to *Rhipsalis.* We agree with the author in regarding it as a distinct genus.

The genus was named for Dr. Ludwig Pfeiffer, a physician by profession and one of the most distinguished authorities on the Cactaceae. He visited Cuba in 1838-1839. Dr. Pfeiffer was born July 4, 1805, at Kassel, Germany, and died in 1877.

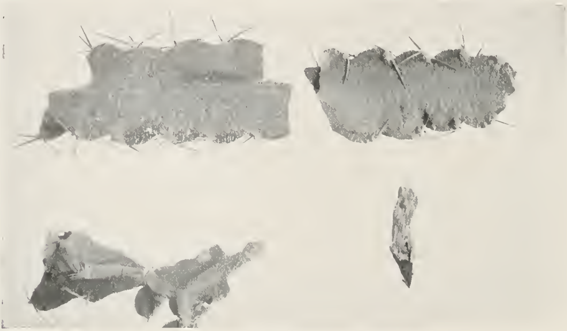


FIG. 211.—Acanthorhipsalis micrantha.

1. Pfeiffera ianthothele (Monville) Weber, Dict. Hort. Bois 944. 1898.

Cereus ianthothele * Monville, Hort. Univ. *1:* 218. 1839.
Pfeiffera cereiformis Salm-Dyck, Cact. Hort. Dyck. 1844. 41. 1845.
Rhipsalis cereiformis Förster, Handb. Cact. 454. 1846.
Hariota cereiformis Kuntze, Rev. Gen. Pl. *1:* 262. 1891.
Rhipsalis ianthothele K. Brandegee, Cycl. Amer. Hort. Bailey *4:* 1514. 1902.

Stem weak, spreading or pendent, 3 to 6 dm. long, 2 cm. in diameter or less; joints 8 to 12 cm. long, 3 to 5-ribbed, 10 mm. in diameter, light green, spiny; ribs tuberculate; areoles 10 mm. apart; spines 6 or 7, 5 to 7 mm. long, yellowish; flowers including the ovary about 15 mm. long; inner perianth-segments 5, pale yellow to cream-colored, acute, erect or slightly spreading at tip; stamens numerous, shorter than the perianth-segments, included; style longer than stamens; stigma-lobes 8, linear, spreading; ovary strongly tuberculate, purplish, its areoles bearing white bristly spines; fruit globose, 12 to 16 mm. in diameter, rose-red, spiny; seeds numerous, black.

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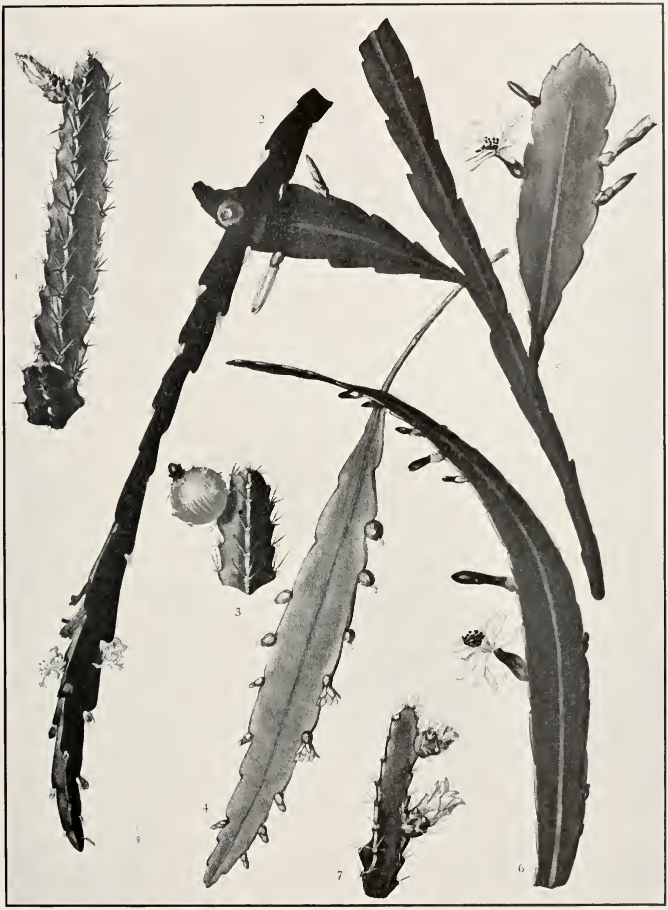
* The specific name is sometimes spelled *janthothele;* it was originally given as *ianthothelus.*



1. Flowering branch of *Pfeiffera ianthothele.*
2. Flowering and fruiting branch of *Lepismium cruciforme.*
3. Top of fruiting branch of *Pfeiffera ianthothele.*
4. Flowering and fruiting branch of *Rhipsalis jamaicensis.*
5. Flowering branch of *Pseudorhipsalis alata.*
6. Flowering and fruiting branch of *Pseudorhipsalis himantoclada.*
7. Flowering branch of *Pfeiffera ianthothele.*

Type locality: Montevideo is cited in the original description, but this must be wrong.

Distribution: Northwestern Argentina, especially in the states of Salta, Tucuman, and Catamarca.

Illustrations: Goebel, Pflanz. Schild. **1:** 45, B; Palmer, Cult. Cact. 191; Förster, Handb. Cact. ed. 2. 895. f. 122; Pfeiffer, Abbild. Beschr. Cact. **2:** pl. 9; Garten-Zeitung **4:** 182. f. 42, No. 10, as *Pfeiffera cereiformis;* Schumann, Gesamtb. Kakteen 611. f. 97, A. B; Blühende Kakteen **3:** pl. 152.

Plate XXII, figures 1 and 7, shows flowering branches from a plant collected by Dr. Shafer in Argentina in 1917 (No. 71), which flowered in April 1919; figure 3 shows the mature fruit.

4. ACANTHORHIPSALIS (Schumann) gen. nov.

Small branching cacti, more or less epiphytic, growing on forest trees or creeping over rocks; joints flattened or sometimes 3-winged, short or elongated, their margins crenate or serrate; areoles spiny; flowers solitary from lateral areoles; perianth-segments united into a short tube; ovary bearing on its surface small scales with tufts of felt in their axils, at least in typical species; seeds small, black, narrowed at base.

The type is *Cereus micranthus* Vaupel and to this genus we have also referred two little-known species of *Rhipsalis,* both of which have flattened joints and spiny areoles. In their habit and armament they resemble *Acanthorhipsalis micrantha* more than they do the true species of *Rhipsalis.* The plants are native of Peru, Bolivia, and Argentina.

KEY TO SPECIES.

Joints crenate.
  Joints about 2 cm. broad; spines 5 to 15 mm. long . . . . 1. *A. micrantha*
  Joints usually 4 to 6 cm. broad; spines 4 mm. long or less . . . . 2. *A. crenata*
Joints serrate . . . . 3. *A. monacantha*

1. Acanthorhipsalis micrantha (Vaupel).

Cereus micranthus Vaupel, Bot. Jahrb. Engler *50:* Beibl. *111:* 19. 1913.

Stems much branched; joints 2 or 3-winged, about 2 dm. long and 2 cm. broad, yellowish green, at least when dry; areoles 6 to 10 mm. apart; spines 3 to 10, 5 to 15 mm. long, brown to blackish, straight or a little curved; flower, including the ovary, 22 mm. long.

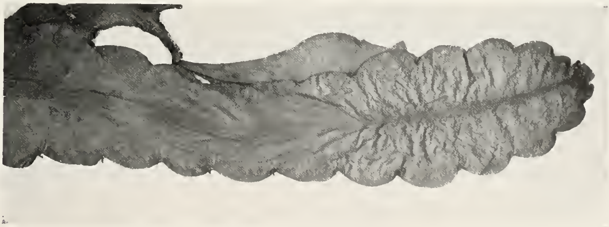


FIG. 212.—Acanthorhipsalis crenata.

Type locality: Sandía, southeastern Peru, altitude 2,100 meters.

Distribution: Known only from the type locality.

This plant was described by Dr. Vaupel as a species of *Cereus,* but as he writes us under date of October 20, 1920, it is of course not a *Cereus* in the stricter sense, but is more nearly related to *Rhipsalis.* This view was taken by Schumann, who had labeled it *Rhipsalis peruviana* Schumann (Vaupel, Bot. Jahrb. Engler **50**: Beibl. **111**: 19. 1913).

The plant was collected by A. Weberbauer July 31, 1902 (No. 1353); a fragment of the type, which is in the Berlin Herbarium, was sent us by Dr. Vaupel in 1920.

Figure 211 is from a photograph of a part of the type specimen now in the National Herbarium at Washington.

2. Acanthorhipsalis crenata (Britton).

Hariota crenata * Britton, Bull. Torr. Club *18:* 35. 1891.

Branches lateral, narrowly oblong, very flat, obtuse, 20 to 30 cm. long, 3 to 6 cm. broad, strongly crenate, with a stout central axis; areoles between crenations rather large, filled with wool and bearing 3 to 8 spines, these 2 to 4 mm. long; flowers red, lateral, small; berry 7 mm. in diameter.

Type locality: Yungas, Bolivia.

Distribution: Known only from the type locality.

When first described, this species was thought to be nearest the Brazilian *Rhipsalis platycarpa,* which it resembles, but that species has no spines.

Figure 212 is from a photograph of Dr. Rusby's herbarium specimen (No. 2047).

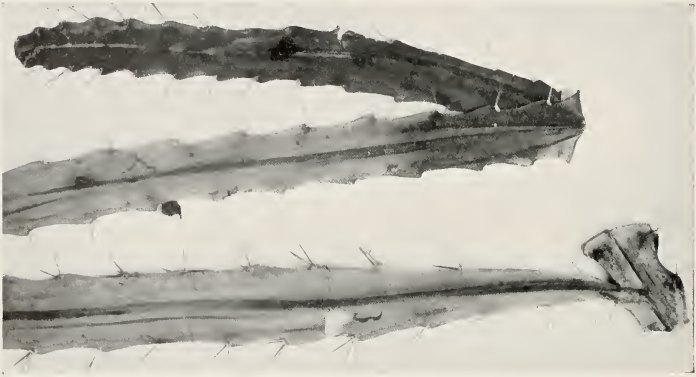


FIG. 213.—Acanthorhipsalis monacantha.

3. Acanthorhipsalis monacantha (Grisebach).

Rhipsalis monacantha Grisebach, Abh. Ges. Wiss. Göttingen *24:* 140. 1879.
Hartiota monacantha Kuntze, Rev. Gen. Pl. *1:* 263. 1891.

Epiphyitc, branching; branches flat and thin, linear-oblong, 2 cm. broad, sometimes 8 dm. long, obtuse, cuneate at base; serrate (acuminate says Schumann, but figured by him as obtuse); areoles white-felted and spiny, spines 1 to 6, but usually only 1 or 2, 5 to 10 mm. long, yellow; flowers solitary at the areoles, lateral, white, 1 cm. long; fruit globular, 8 to 10 mm. in diameter, white; seeds blackish, pitted, obovoid.

Type locality: Oran, near San Andrés, Argentina.

Distribution: Northern Argentina.

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* This name is printed *H. cinerea* in the Index Kewensis.

Illustration: Schumann, Gesamtb. Kakteen 633. f. 98, H, as *Rhipsalis monacantha.*

Figure 213 is from a photograph of a herbarium specimen collected at Calilegua, Jujuy, Argentina, by J. A. Shafer in 1917 (No. 56).

5. PSEUDORHIPSALIS gen. nov.

Epiphytic, much branched, and elongated cacti, at first erect, but soon prostrate or hanging; branches flattened, rather thin, serrate or crenate; flowers numerous, borne solitary at the lateral areoles, narrowly campanulate; segments united into a short but definite tube; ovary and fruit globular, bearing several scales; seeds black.

Two species are here included, of which *Cactus alatus* Swartz is made the generic type. These plants in their habit and branches resemble certain species of *Rhipsalis,* especially *R. ramulosa* and its relatives, but differ from all the species of *Rhipsalis* in having united perianth-segments and more scaly ovary and fruit.

KEY TO SPECIES.

Ovary and outer perianth-segments reddish..1. *P. himantoclada*
Ovary and outer perianth-segments greenish or yellowish green..............................2. *P. alata.*

1. Pseudorhipsalis himantoclada (Roland-Gosselin).

Rhipsalis himantoclada Roland-Gosselin, Bull. Soc. Bot. France *55:* 694. 1908.
Wittia costaricensis Britton and Rose, Contr. U. S. Nat. Herb. *16:* 261. 1913.

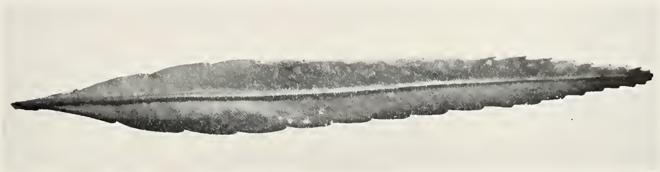


FIG. 214.—Pseudorhipsalis himantoclada.

Stems 4 to 5 dm. long, erect or curved, flat, 1 to 3 cm. broad, with horizontal branches narrowed at base, pointed, the margin low-serrate; areoles 12 to 15 mm. apart; ovary, tube, and sepals purplish; ovary 3 mm. long, bearing a few very short scales; tube of flower about 8 mm. long; inner perianth-segments white, obtuse, spreading; stamens erect; style white; stigma-lobes 4.

Type locality: Pozo Azul, Costa Rica.

Distribution: Costa Rica.

We are told by Mr. Otón Jiménez that Mr. Wercklé, who first collected the plant, would refer *Wittia costaricensis* here. He states also that it is very luxuriant and when growing wild becomes so large that one man can not carry a single plant.

Illustration: Contr. U. S. Nat. Herb. 16: pl. 82, as *Wittia costaricensis.*

Plate XXII, figure 6, shows a flowering branch collected by Wercklé in 1907 which flowered in the New York Botanical Garden, December 20, 1911. Figure 214 is from a photograph of a terminal branch; figure 215 shows a flowering branch; figure 216 shows a flower cut longitudinally.

2. Pseudorhipsalis alata (Swartz).

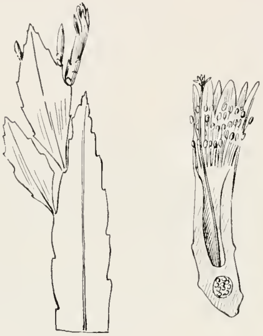
Cactus alatus Swartz, Prodr. 77. 1788.
Cereus alatus De Candolle, Prodr. *3:* 470. 1828.
Epiphyllum alatum Haworth, Phil. Mag. *6:* 109.. 1829. Not Haworth, 1819.
Rhipsalis swartziana Pfeiffer, Enum. Cact. 131. 1837.
Hariota swartziana Lemaire, Cact. Gen. Nov. Sp. 75. 1839.
Rhipsalis alata Schumann in Martius, Fl. Bras. *4²:* 288. 1890.
Hariota alata Kuntze, Rev. Gen. Pl. *1:* 262. 1891.
Rhipsalis harrisii Gürke, Monatsschr. Kakteenk. *18:* 180. 1809.

Pendent from trees and rocks, up to 5 meters long, branched; joints broadly linear to lanceolate or linear-oblong, 2 to 4 dm. long, 3 to 6 cm. broad, obtuse, the margin crenate-undulate; flowers yellowish white, 15 mm. long; flower-tube 4 mm. long; perianth-segments 10, lanceolate, acute; stamens numerous, about half as long as perianth; style slender; stigma-lobes 5; ovary somewhat tubercled, bearing several broad scales; fruit ovoid, 1 cm. long, yellowish green; seeds obovate, black, bearing depressed tubercles; hilum oblique.

Type locality: Jamaica.

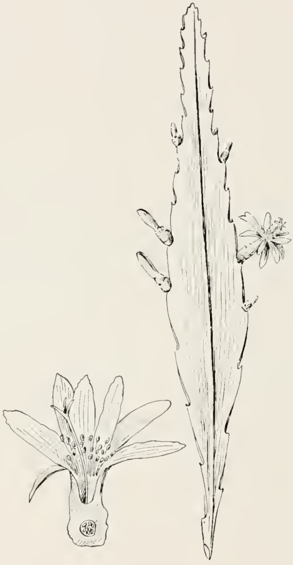
Distribution: Mountains of Jamaica.

This plant has usually passed as a *Rhipsalis,* but its definite flower-tube and somewhat tubercled and scaly ovary exclude it from that genus. This species has long been known in Jamaica; it was mentioned by Sloane as a spineless *Opuntia* and it is also referred to by Patrick Browne.



215 216

Figs. 215 and 216.—Top of flowering branch and longitudinal section of flower of Pseudorhipsalis himantoclada. x 2.



Figs. 217 and 218.—Section of flower and flowering branch of Pseudorhipsalis alata. x 0.66.

217 218

Cactus dentatus Ruiz (Martius, Fl. Bras. 4^2: 288. 1890) was given as a synonym of *Rhipsalis alata* by Schumann, but better referred to *R. ramulosa* (see page 241).

Cereus alatus crassior Salm-Dyck (Hort. Dyck. 66. 1834) is only a name, which may or may not refer to the Jamaican plant.

Illustration: Torreya **9:** 157. f. 2, as *Rhipsalis alata.*

Plate XXII, figure 5, shows a plant collected by Dr. Britton in Jamaica in 1907, which flowered in the New York Botanical Garden, November 8, 1912. Figure 218 shows a flowering branch (natural size); figure 217 shows half of a flower with tube, perianth-segments, and stamens.

6. LEPISMIUM Pfeiffer, Allg. Gartenz. 3: 315, 380. 1835.

Saxicolous or epiphytic cacti, usually much branched and elongated, the branches flat, angled or 3-winged, the margins strongly crenate; areoles in the crenations producing a tuft of long white hairs; flowers 1 to 5 at an areole, white to pinkish; perianth-segments united at base into a short tube; filaments slender, adnate to flower-tube; stigma-lobes 4 or 5; fruit globose, smooth, turgid, purple; seeds minute; cotyledons broad, acuminate.

Type species: *Lepismium commune* Pfeiffer.

We recognize but one species, which has been described under many names. The generic name is from the Greek, meaning a scale, referring to the small scales subtending the areole.

1. Lepismium cruciforme (Vellozo) Miquel, Bull. Neerl. 49. 1838.

Cactus cruciformis Vellozo, Fl. Flum. 207. 1825.
Cereus tenuispinus Haworth, Phil. Mag. *1:* 125. 1827.
Cereus myosurus Salm-Dyck in De Candolle, Prodr. *3:* 469. 1828.
Cereus tenuis De Candolle, Prodr. *3:* 469. 1828.
Cereus squamulosus Salm-Dyck in De Candolle, Prodr. *3:* 469. 1828.
Cereus setosus Loddiges, Bot. Cab. *19:* pl. 1887. 1832.
Lepismium tenue Pfeiffer, Allg. Gartenz. *3:* 315. 1835.
Lepismium commune Pfeiffer, Allg. Gartenz. *3:* 315. 1835.
Lepismium knightii Pfeiffer, Allg. Gartenz. *3:* 380. 1835.
Lepismium myosurus Pfeiffer, Enum. Cact. 139. 1837.
Cereus cruciformis Steudel, Nom. ed. 2. *1:* 333. 1840.
Rhipsalis myosurus Förster, Handb. Cact. 455. 1846.
Rhipsalis mittleri Förster, Handb. Cact. 455. 1846.
Rhipsalis knightii Förster, Handb. Cact. 456. 1846.
Lepismium myosurus knightii Salm-Dyck in Labouret, Monogr. Cact. 445. 1853.
Lepismium myosurus laevigatum Salm-Dyck in Labouret, Monogr. Cact. 446. 1853.
Lepismium radicans Vöchting, Jahrb. Wiss. Bot. Leipzig *9:* 399. 1873.
Lepismium cavernosum Lindberg, Gartenflora *39:* 151. 1890.
Rhipsalis brevibarbis Schumann in Martius, Fl. Bras. 4^2: 268. 1890.
Rhipsalis squamulosa Schumann in Martius, Fl. Bras. 4^2: 280. 1890.
Rhipsalis macropogon Schumann in Martius, Fl. Bras. 4^2: 282. 1890.
Hariota cruciformis Kuntze, Rev. Gen. Pl. *1:* 262 1891.
Hariota squamulosa Kuntze, Rev. Gen. Pl. *1:* 263. 1891.
Hariota knightii Kuntze, Rev. Gen. Pl. *1:* 263. 1891.
Hariota knightii tenuispinis Kuntze, Rev. Gen. Pl. *1:* 263. 1891.
Rhipsalis anceps Weber, Rev. Hort. *64:* 427. 1892.
Rhipsalis cavernosa Schumann, Monatsschr. Kakteenk. *3:* 24. 1893.
Rhipsalis radicans Weber, Dict. Hort. Bois 1047. 1898.
Rhipsalis radicans anceps Weber, Dict. Hort. Bois 1047. 1898.
Rhipsalis radicans ensiformis Weber, Dict. Hort. Bois 1047. 1898.
Lepismium cavernosum ensiforme Weber in Roland-Gosselin, Rev. Hort. *70:* 108. 1899.

Uusually creeping over rocks, freely rooting, appressed, somewhat branching; branches foliaceous, usually flat, sometimes 3, 4, or even 5-angled, linear-lanceolate, 2 cm. broad, narrowed at base, more or less purplish, especially on edges; margins somewhat repand; areoles sunken in margins; flowers white, 2 to 5 or even more from an areole, 12 to 13 mm. long; fruit globular, juicy, purplish to red, translucent, 6 to 12 mm. in diameter; seeds light brown to black, 1.8 mm. long.

Type locality: Coast of Brazil.

Distribution: States of Rio de Janeiro and Minas Geraes, Brazil.

Rhipsalis radicans rosea Weber (Dict. Hort. Bois 1047. 1898) has small rose-colored flowers which, according to Weber, resemble those of *R. myosurus.*

Schumann (Gesamtb. Kakteen 649. 1898) gives *Lepismium anceps* Weber (in Hort. Paris) as a synonym for *Rhipsalis anceps.* Here belongs also *R. ensiformis* Weber (Dict. Hort. Bois 1047. 1898).

Some of the plants now in cultivation are not so broadly winged as is shown in the illustration in Curtis's Botanical Magazine referred to below. This illustration was based upon specimens which were supposed to have come from Prince de Salm-Dyck and, therefore, presumably are typical.

Cereus knightii Parmentier (Pfeiffer, Enum. Cact. 139. 1837) is given as a synonym of *Lepismium knightii.*

Cactus tenuis Schott (De Candolle, Prodr. 3: 469. 1828) was cited as a synonym of *Cereus tenuis.*

Schumann cited *Lepismium mittleri* as a synonym of *Rhipsalis squamulosa,* referring it to Förster (Handb. Cact. 455. 1846), but the plant is there described as *Rhipsalis mittleri.*

Cereus elegans Hortus appeared first (Pfeiffer, Enum. Cact. 138. 1837) as a synonym of *Lepismium commune,* while the Index Kewensis refers it to *Rhipsalis mittleri.*

Cereus myosurus tenuior Salm-Dyck (Hort. Dyck. 65. 1834) is only a name.

Lepismium cavernosum minus Lindberg is a name mentioned by Roland-Gosselin (Rev. Hort. **70**: 108. 1899).

Lepismium duprei, the name mentioned by Salm-Dyck (Cact. Hort. Dyck. 1844. 41. 1845) and by Förster (Handb. Cact. 456. 1846) as in the collections at Paris, was never described.

Lepismium laevigatum Salm-Dyck (Cact. Hort. Dyck. 1844. 41. 1845) is without description, nor do we find it listed in the Index Kewensis.

Illustrations: Fl. Flum. **5**: pl. 29, as *Cactus cruciformis;* Loddiges, Bot. Cab. **19**: pl. 1887; Loudon, Encycl. Pl. ed. 2. 1202. f. 17365, as *Cereus setosus;* Palmer, Cult. Cact. 195, as *Lepismium;* Curtis's Bot. Mag. **66**: pl. 3755; Garten-Zeitung **4**: 182. f. 42, No. 3; Loudon's Encycl. Pl. ed. 3. 1380. f. 19411, as *Lepismium myosurum;* Monatsschr. Kakteenk. **3**: 41, as *L. knightii;* Abh. Bayer. Akad. Wiss. München **2**: pl. 7, f. 1; Curtis's Bot. Mag. **66**: pl. 3763; Förster, Handb. Cact. ed. 2. 898. f. 123 (in error 103); Loudon, Encycl. Pl. ed. 3. 1380. f. 19412; Nov. Act. Nat. Cur. **19**^{1}: pl. 16, f. 12, as *L. commune;* Goebel, Pflanz. Schild. **1**: pl. 2, f. 3, 4, as *L. radicans* (seedling); Gartenwelt **16**: 633; Schumann, Gesamtb. Kakteen f. 98, C, D, as *Rhipsalis cavernosa;* Gartenflora **39**: f. 38, as *Lepismium cavernosum;* Martius, Fl. Bras. **4**^{2}: pl. 55, f. 2, as *Rhipsalis macropogon;* Arch. Jard. Bot. Rio de Janeiro **1**: pl. 25, as *Rhipsalis radicans;* Arch. Jard. Bot. Rio de Janeiro **1**: pl. 24, as *R. myosura;* Möllers Deutsche Gärt. Zeit. **25**: 477. f. 11, No. 19, as *R. squamulosa;* Rev. Hort. **85**: f. 152, as *R. anceps.*

Plate XXII, figure 2, shows the plant obtained by Dr. Rose in Brazil in 1915 which flowered November 18 of that year.

LEPISMIUM RAMOSISSIMUM Lemaire in Förster, Handb. Cact. ed. 2. 899. 1885.

Rhipsalis ramosissima Schumann in Martius, Fl. Bras. *4*^{2}*:* 299. 1890.
Hariota ramosissima Kuntze, Rev. Gen. Pl. *1:* 263. 1891.

This is a very uncertain species which we know only from descriptions. It is from Brazil.

7. HATIORA Britton and Rose, Stand. Cycl. Hort. Bailey 3: 1432. 1915.

Hariota De Candolle, Mém. Cact. 23. 1834. Not Adanson, 1763.

Unarmed, slender, branched cacti; branches terete, short, arising in 2's or 3's from tops of older ones, smooth, leafless and spineless,* bearing several small areoles along their sides and each a large, woolly, terminal one from which the flower and succeeding branches arise; sepals usually in 2 series, outer ones broader and short, inner ones larger and more petal-like; petals distinct, narrowed toward base; stamens distinct, erect, borne on disk; stigma-lobes 4 or 5, erect or a little spreading, white; ovary globular, naked or nearly so.

Type species: *Rhipsalis salicornioides* Haworth.

Some six or seven species have been described; we recognize three.

The genus *Hariota* was named for Thomas Hariot, a botanist of the 16th century, *Hatiora* being an anagram. It is closely related to *Rhipsalis,* with which it is often united.

The flowers open only in bright sunlight and are rotate or nearly so. In the United States the plants flower under glass, usually in the winter from December to February, but sometimes as late as April.

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* Sometimes peculiar lateral branches are produced which are made up of short, rounded joints with numerous areoles bearing several bristles or hairy spines. See illustrations of Schumann (Gesamtb. Kakteen f. 97, D) and Loddiges (Bot. Cab. *4:* 369). In cases which we have observed these occur on stunted or starved plants, the areoles arranged in 6 rows forming low angles on the branchlets.

KEY TO SPECIES.

Lower part of joints slender, pedicel-like . . . . 1. *H. salicornioides*
Joints only slightly narrowed below or not narrowed.
  Joints clavate . . . . 2. *H. bambusoides*
  Joints cylindric . . . . 3. *H. cylindrica.*

1. Hatiora salicornioides (Haworth) Britton and Rose, Stand. Cycl. Hort. Bailey 3: 1433. 1915.

Rhipsalis salicornoides Haworth, Suppl. Pl. Succ. 83. 1819.
Cactus salicornioides[*] Link and Otto, Icon, Pl. Select. 49. 1822.
Cactus lyratus Vellozo, Fl. Flum. ed. 2. *4:* 205. 1825.
Hariota salicornioides De Candolle, Mém. Cact. 23. 1834.
Rhipsalis salicornioides strictior Salm-Dyck, Cact. Hort. Dyck. 1849. 230. 1850.
Hariota salicornioides strictior Gürke, Blühende Kakteen *2:* under pl. 95. 1907.

Stems 1 to 2 meters long with a jointed cylindric trunk; branchlets club-shaped, the lower part very slender and pedicel-like, 1.5 to 3 cm. long, green or purplish; areoles of cultivated specimens without setae; flowers 8 to 10 mm. long, salmon-colored; the outer sepals short and obtuse; inner petals somewhat crenate, obtuse; filaments yellowish, at top appressed against style, shorter than petals; style yellowish; stigma-lobes 4 or 5, white.

Type locality: Recorded originally from the West Indies in error.

Distribution: Southeast Brazil.

These plants grow quite differently in the woods from the way they do in greenhouses. The following note was made by Dr. Rose in 1915 while collecting at Rio de Janeiro:

> The plant grows on trunks of trees, its roots long and fibrous, 4 dm. long or more and wrapped about the trunk of the tree; at first it is erect, then spreading and finally pendent; it is then a meter longer or more and very much branched; main stem and branches 5 to 10 mm. in diameter, made up of short terete joints (2 to 5 cm. long); branches in whorls of 2 to 6.

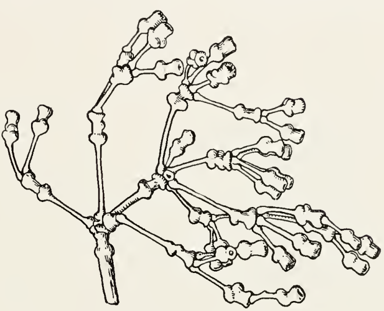

FIG. 219.—Unusual form of Hatiora salicornioides. x 0.8.

A very remarkable form, if not a distinct species, was obtained by Dr. Rose in the forest of Itatiaya, altitude 1,200 meters, in July 1915 (No. 20585). The terminal joints are 1 to 2 cm. long, the lower half slender, pedicel-like, the upper half twisted and contorted. This is well shown in our illustration (figure 219).

Rhipsalis salicornioides gracilior (Salm-Dyck, Cact. Hort. Dyck. 1844. 40. 1845; *Hariota salicornioides gracilior* Gürke, Blühende Kakteen. 2: under pl. 95. 1907) is only a name.

The following varieties of *Rhipsalis salicornioides* of Weber are probably to be referred here: var. *gracilis* Weber (Dict. Hort. Bois 1048. 1898; *Rhipsalis gracilis* Weber and *Hariota gracilis* Weber, Dict. Hort. Bois 1048. 1898) and var. *stricta* Weber (Dict. Hort. Bois 1048. 1898; *Rhipsalis stricta* Cels, Dict. Hort. Bois 1048. 1898). The name *Rhipsalis stricta* seems never to have been published. Weber cited it as above, referring it to Cels as the author. Schumann uses the name earlier where he states that it was used in France for *Hariota salicornioides* (Monatsschr. Kakteenk. 4: 74. 1894). Pfeiffer refers here as a synonym *Opuntia salicornioides* (Enum. Cact. 141. 1837), attributing the name to Sprengel, who, however, used it as *Cactus* (*Opuntia*) *salicornioides. Hariota sticta* has been used (Monatsschr. Kakteenk. 5: 22. 1895). The variety *ramosior* Salm-Dyck (Pfeiffer, Enum. Cact. 142. 1837) may or may not belong to this species.

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[*] This name is often credited to Sprengel (Syst. *2:* 497. 1825).

Rhipsalis schottmuelleri Hortus is given by Schelle (Handb. Kakteenk. 227. 1907) as a synonym of *Hariota salicornioides schottmuelleri*, an unpublished variety.

Hariota villigera (Schumann in Martius, Fl. Bras. 4^2: 265. 1890; *Rhipsalis salicornioides villigera* Löfgren, Arch. Jard. Bot. Rio de Janeiro **1**: 85. 1915) we know from description only; it seems to be stouter than *salicornioides* but may belong here. It was based on Sellow's specimen from Sao Paulo, but its flowers were unknown.

Illustrations: Loddiges, Bot. Cab. **4**: pl. 369; Cact. Journ. **1**: 180; Curtis's Bot. Mag. **51**: pl. 2461; Blanc, Cacti 90. No. 1013; Balt. Cact. Journ. **1**: 122; Gard. Chron. II. **6**: 731. f. 134; Amer. Gard. **11**: 463; Goebel, Pflanz. Schild. **1**: pl. 4, f. 5, 6; Möllers Deutsche Gärt. Zeit. **25**: 477. f. 11, No. 17; Arch. Jard. Bot. Rio de Janeiro **1**: pl. 12; Gartenwelt **13**: 117, as *Rhipsalis salicornioides;* Link and Otto, Icon. Pl. Select. pl. 21, as *Cactus salicornioides;* Schumann, Gesamtb. Kakteen f. 97, C, D; Martius, Fl. Bras. 4^2: pl. 52; Monatsschr. Kakteenk. **5**: 23; Schelle, Handb. Kakteenk. 227. f. 148, as *Hariota salicornioides:* Rev. Hort. **1861**: 110. f. 23, as *Rhipsalis salicorne:* Fl. Flum. **5**: pl. 21, as *Cactus lyratus.*

Plate XXIII, figure 4, shows a plant in the New York Botanical Garden which flowered February 2, 1912. Figure 219 shows a peculiar form collected by Dr. Rose in Brazil in 1915.

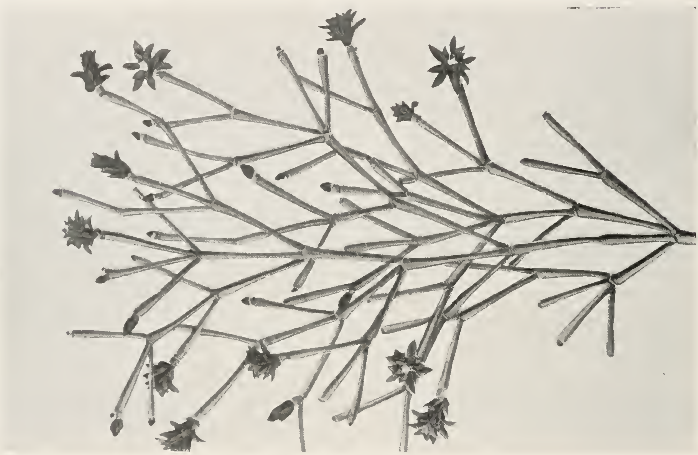


FIG. 220.—Hatiora bambusoides.

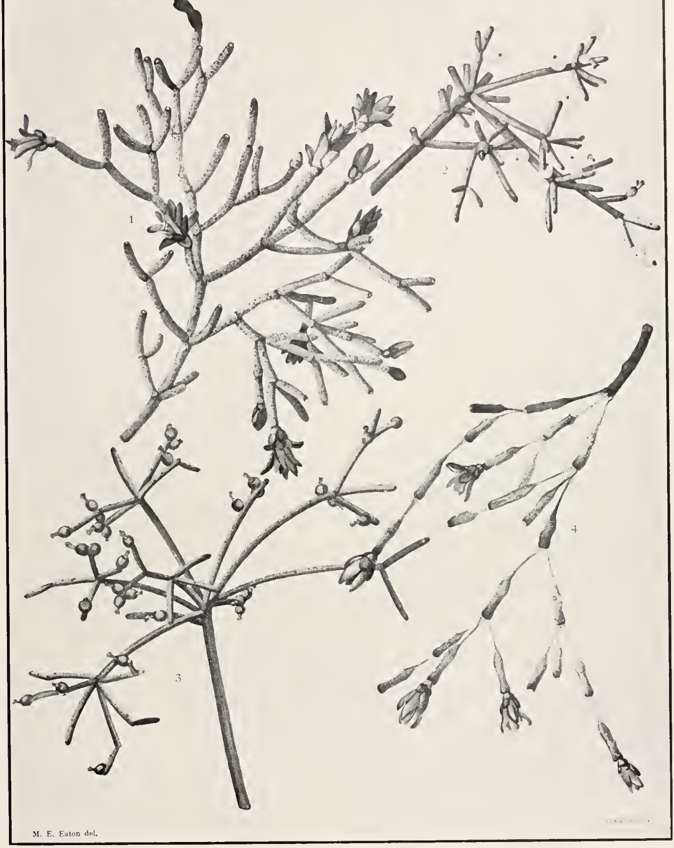
2. Hatiora bambusoides (Weber).

Rhipsalis salicornioides bambusoides Weber, Rev. Hort. *64:* 429. 1892.
Hariota salicornioides bambusoides Schumann, Gesamtb. Kakteen 613. 1898.
Rhipsalis bambusoides Löfgren, Arch. Jard. Bot. Rio de Janeiro *2:* 41. 1918.

Stems becoming 2 meters high and stouter than those of *H. salicornioides;* joints clavate, 3 to 5 cm. long, 4 mm. in diameter at the top; flowers orange; sepals obtuse; petals usually erect but sometimes spreading.

Type locality: Brazil.

Distribution: State of Rio de Janeiro, Brazil.



M. E. Eaton del.

1. Flowering branch of *Hatiora cylindrica.*
2. Fruiting branch of *Rhipsalis heteroclada.*
3. Fruiting branch of *Rhipsalis cribrata.*
4. Flowering branch of *Hatiora salicornioides.*

(All three-fourths size.)

Introduced into Jardin des Plantes, Paris, France, from Brazil.

We have not seen this type material, but if plate 95 in the Blühende Kakteen is typical, our identification is correct. In the description accompanying this plate it is stated that the drawing was made from a plant sent by Mr. Weber to the Berlin Botanical Garden.

Hariota bambusoides Weber (Dict. Hort. Bois 1048. 1898) was given as a synonym but was never described.

Illustrations: Blühende Kakteen **2**: pl. 95, as *Hariota salicornioides bambusoides;* Gartenwelt **13**: 117, as *Rhipsalis salicornioides bambusoides.*

Figure 220 is reproduced from the first illustration cited above.

3. **Hatiora cylindrica** sp. nov.

Forming dense masses one meter in diameter or more; joints cylindric, 3 cm. long or less, pale green, becoming spotted or finally red throughout; flowers usually solitary, 12 mm. long; sepals ovate, short, red; petals orange to yellow, oblong, obtuse.

Collected by J. N. Rose in company with Dr. Löfgren and Señor Porto at Ilha Grande, Districto Federal, near Rio de Janeiro, July 22 to 24, 1915.

Illustration: Arch. Jard. Bot. Rio de Janeiro **2**: pl. 13, as *Rhipsalis bambusoides.*

Plate XXIII, figure 1, shows the plant collected by Dr. Rose on Ilha Grande, near Rio de Janeiro, which flowered in the New York Botanical Garden, December 18, 1918.

8. RHIPSALIS Gaertner, Fruct. Sem. 1: 137. 1788.

* *Hariota* Adanson, Fam. Pl. *2:* 243. 1763.
† *Cassytha* Miller, Gard. Dict. ed. 8. 1768. Not Linnaeus, 1753.

Cacti sometimes growing in humus, but usually epiphytic and hanging from trees, somtimes erect, sometimes clambering over rocks, more or less rooting or, when hanging, irregularly producing aërial roots; roots always fibrous; stems usually much branched (often heteromorphic), terete, angled or much flattened and leaf-like, very slender and thread-like or stout and stiff; leaves wanting or represented by minute bracts; areoles borne along margin of flat-branched forms, along ribs or scattered irregularly in other forms, usually small, bearing hairs, wool, bristles, and flowers; flowers usually solitary, but sometimes several from a single areole, opening night or day and remaining open for 1 to 8 days, small for the family; perianth-segments distinct, few, sometimes only 5, usually spreading, sometimes reflexed; filaments few or numerous, erect, slender, borne on outer margin of disk in one or two rows; style erect; stigma-lobes 3 or more, usually slender, spreading; ovary small, sometimes depressed or sunken in branch; fruit globular or oblong, sometimes angled when immature, but finally turgid, juicy, white or colored, usually naked (setose at areoles in 1 or 2 species) or sometimes bearing a few scales; seeds small, few to many.

Type species: *Rhipsalis cassutha* Gaertner.

The generic name is from the Greek, meaning wicker-work, referring to the slender, pliable branches of the typical species.

We recognize 57 species, although more than 115 names have been published.

The species range from Florida, Mexico, and the West Indies through continental America to Argentina; only 2 species are found in Mexico; 1 in Florida; 2 are known in the West Indies; a very few in northern South America; 3 or 4 only on the west coast of South America; and 5 or 6 in Argentina. The center of distribution is in the states of Rio de Janeiro, Sao Paulo and Minas Geraes, in southern Brazil. In the little state of Rio de Janeiro and chiefly about the city of the same name, Dr. Rose collected 15 species in 1915.

The occurrence of species of *Rhipsalis,* in the wild state, in tropical Africa and in Ceylon, forms the only possible exception to the American natural distribution of cacti. Eight supposedly distinct species have been described by authors from tropical Africa, and *R. cassutha* has long been known to exist in Ceylon. M. Roland-Gosselin, a diligent French student of cacti, after an investigation of these Old World plants, published in 1912 a very interesting paper,* giving his conclusion that they are really all American species, their seeds having been transmitted to the Old World by migratory birds, and he referred them all to known American species. We have followed him in these reductions but we have not been able in all cases to study authentic specimens. It raises the interesting question if the Old World plants should be regarded as native or introduced.

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* No species was cited by Adanson for his genus *Hariota* but it was based on Burmann's plate of Plumier (pl. 197, f. 2), which has been identified as *Cactus parasiticus* Lamarck, not Linnaeus. The type of *Cactus parasiticus* Linnaeus is a species of *Vanilla,* probably *V. claviculata* Swartz.

† Miller, in his Gardeners' Dictionary of 1768, described *Rhipsalis cassutha* under the name of *Cassytha filiformis,* a name which had already been published by Linnaeus for a wholly different plant. Miller's generic name, *Cassytha,* therefore, being a misidentification, should not be treated as a synonym proper of *Rhipsalis,* although usually so cited.

In stem structure some of the species, such as *Rhipsalis elliptica*, approach very closely *Zygocactus truncatus*, while certain forms of *Epiphyllanthus* are easily mistaken for a *Rhipsalis*.

As we have treated the genus here, the flowers and fruits are fairly uniform. The stem structures are various and parallel in a way those of *Opuntia*, ranging from slender and terete to broad and thin; in some species they are leaf-like as in *Epiphyllum*, or 3-angled, suggesting *Hylocereus*. The areoles are usually small and bear only a small tuft of wool, but in some species they bear hairs or bristles. The flowers may open at any time of the day and in most species do not close at the approach of night; they are not readily affected by shade or direct sunlight and open but once.

KEY TO SPECIES.

- A. Joints terete, ribbed or angled, none of them flat.
  - B. Joints terete or young ones angled, smooth, or areoles bristly or hairy.
    - C. Joints short, oblong, not more than 5 times as long as thick; areoles of young joints with a few long hairs.
      - Lateral joints simple; flowers lateral. Series 1, *Mesambryanthemoides* .... 1. *R. mesambryanthemoides*
      - Lateral joints much branched; flowers terminal. Series 2, *Cereusculae* .... 2. *R. cereuscula*
    - CC. Joints cylindric, rarely clavate, slender, short or elongated.
      - D. Flowering areoles small, not very woolly, not depressed.
        - E. Ultimate joints slender, about 2.5 mm. thick or less, relatively short.
          - F. Young joints or some of them angled, their areoles bearing hairs. Series 3, *Prismaticae*.
            - Species of Brazil or Madagascar .... 3. *R. prismatica*
            - Species of Costa Rica .... 4. *R. simmleri*
          - FF. All joints cylindric to clavate. Series 4, *Capilliformes*.
            - Joints clavate .... 5. *R. clavata*
            - Joints cylindric.
              - Ultimate joints up to 2.5 mm. thick; petals 9 mm. long .... 6. *R. campos-portoana*
              - Ultimate joints about 1.5 mm. thick; petals 6 mm. long or less
                - Plant stiff; areoles red; flowers white .... 7. *R. heteroclada*
                - Plant weak; areoles not red.
                  - Flowers greenish white or yellowish, 5 to 6 mm. wide .... 8. *R. capilliformis*
                  - Flowers white or nearly white, about 8 mm. wide.
                    - Pendent; secondary branches 2 to 3-chotomous .... 9. *R. burchellii*
                    - Spreading or diffuse; upper branches subverticillate .... 10. *R. cribrata*
          - FF. All joints cylindric to clavate. Series 4, *Capilliformis*.
          - F. Scale subtending the areoles inconspicuous or none.
            - G. Ultimate joints 3 to 6 mm. thick. Series 5, *Cassuthae*.
              - H. Ultimate joints definitely shorter than others, often verticillate.
                - Plants weak, pendent .... 11. *R. cassutha*
                - Plants stiffer, not strictly pendent.
                  - Ultimate joints slender .... 12. *R. virgata*
                  - Ultimate joints stout .... 13. *R. teres*
              - HH. Ultimate joints not definitely shorter than others, simple or dichotomous, rarely verticillate.
                - I. Areoles without bristles or with spreading bristles.
                  - Petals about 4 mm. long.
                    - Fruit naked.
                      - Petals pink .... 14. *R. lindbergiana*
                      - Petals white .... 15. *R. shaferi*
                    - Fruit with scales and these setose in axils .... 16. *R. fasciculata*
                  - Petals 8 to 12 mm. long.
                    - Flowers purplish red; areoles not bristly .... 17. *R. pulchra*
                    - Flowers white; areoles somewhat bristly .... 18. *R. lumbricoides*

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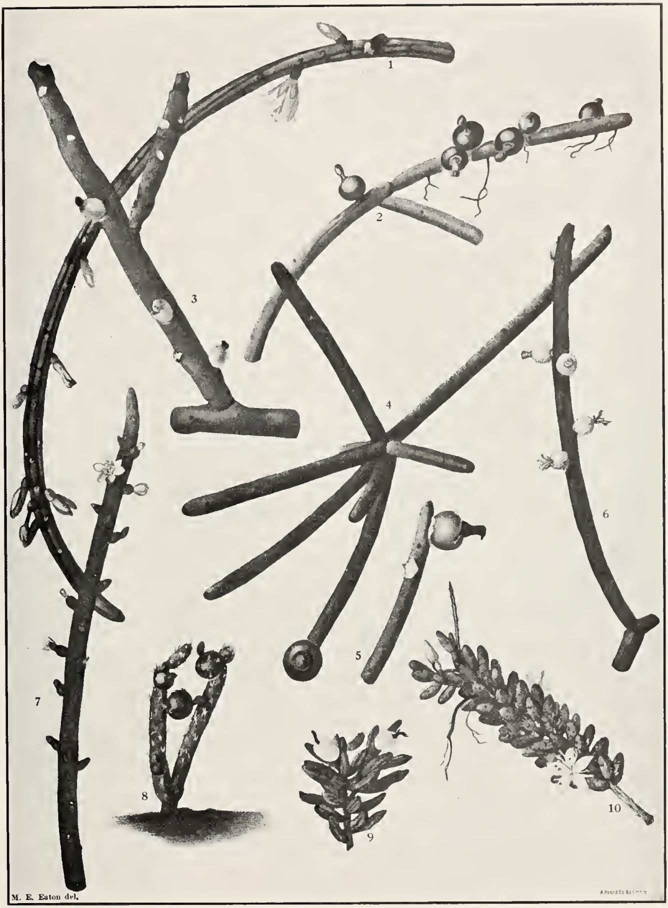
* Bull. Soc. Bot. France *59:* 97-102. 1912. Translation in Torreya *13:* 151-156. 1913.



1. Flowering branch of *Rhipsalis leucorhaphis.*
2. Fruiting branch of same.
3. Fruiting branch of *Rhipsalis megalantha.*
4. Fruiting branch of *Rhipsalis neves-armondii.*
5. Fruiting branch of same.
6. Fruiting branch of *Rhipsalis pittieri.*
7. Flowering and fruiting branch of *Rhipsalis shaferi.*
8. Fruiting branch of *Rhipsalis aculeata.*
9. Fruiting branch of *Rhipsalis mesembryanthemoides.*
10. Flowering branch of same.

(All three-fourths size.)

KEY TO SPECIES—continued.

H. All areoles with appressed bristles..........19. *R. aculeata*
GG. Ultimate joints 8 to 12 mm. thick. Series 6, *Grandiflorae*.
Flowers 2 to 2.5 cm. broad..........20. *R. grandiflora*
Flowers up to 4 cm. broad..........21. *R. megalantha*
FF. Scale subtending the areole white, scarious, appressed, conspicuous. Series 7, *Leucorhaphes*.
Joints 5 to 8 mm. thick; areoles with deciduous bristles..........22. *R. leucorhaphis*
Joints 3 mm. thick; areoles without bristles..........23. *R. loefgrenii*
DD. Flowering areoles large, very woolly, depressed. Series 8, *Floccosae*.
Ultimate joints much shorter than others; verticillate; plants stiff..........24. *R. neves-armondii*
Ultimate joints not much shorter than others; plants weak.
Main branches stout, 8 to 10 mm. in diameter.
Fruit pure white; Venezuelan species..........25. *R. pittieri*
Fruit red or tinged with red; Brazilian and Argentine species.
Fruit bright red..........26. *R. pulvinigera*
Fruit whitish but when mature tinged with red or purple.
Fruit 5 mm. in diameter; flowers white, becoming yellowish..........27. *R. floccosa*
Fruit 8 to 10 mm. in diameter; flowers tinged with red, larger than the last..........28. *R. tucumanensis*
All branches slender, 3 to 6 mm. in diameter.
Flowers white..........29. *R. gibberula*
Petals with red tips..........30. *R. puniceo-discus*
BB. Joints ribbed or angled, at least when old.
C. Some joints bristly, others unarmed, ribbed when old. Series 9, *Dissimiles*..........31. *R. dissimilis*
CC. All joints unarmed, angled or winged.
Joints 5-angled or 5-winged.
Joints 5-winged; wings crenate. Series 10, *Pentapterae*..........32. *R. pentaptera*
Joints 5-angled; ribs nearly continuous. Series 11, *Sulcatae*..........33. *R. sulcata*
Joints 3-angled.
Angles of joints continuous, wingless. Series 12, *Trigonae*..........34. *R. trigona*
Angles of joints interrupted, winged. Series 13, *Paradoxae*..........35. *R. paradoxa*
AA. At least some of joints flat, on same plant or on different plants.
B. Joints deeply serrate; flowers nodding. Series 14, *Houlletianae*..........36. *R. houlletiana*
BB. Joints repand, entire or crenate; flowers not nodding.
C. Joints linear to linear-lanceolate. Series 15, *Lorentzianae*.
D. Joints both flat and 3-angled or rarely 4-angled, mostly narrowly linear.
Fruit black.
Joints 10 mm. wide or less; fruit 5 to 6 mm. in diameter..........37. *R. warmingiana*
Joints 10 to 15 mm. wide; fruit about 10 mm. in diameter..........38. *R. gonocarpa*
Fruit white to reddish.
Joints long-acuminate..........39. *R. linearis*
Joints blunt.
Joints scarcely crenate; Ecuadorean and Peruvian species..........40. *R. micrantha*
Joints definitely crenate; Costa Rican species..........41. *R. tonduzii*
DD. All joints flat, linear-lanceolate to oblong.
Joints deeply crenate, the lobes rounded..........42. *R. boliviana*
Joints repand, low-crenate, or nearly entire.
Joints coriaceous, distinctly crenate..........43. *R. lorentziana*
Joints thin in texture, merely repand or low-crenate.
Bolivian species..........44. *R. ramulosa*
West Indian and Central American species.
Larger joints 3 cm. wide..........45. *R. purpusii*
Joints 0.5 to 2.5 cm. wide.
Perianth-segments 7 to 8 mm. long, greenish white or pinkish..........46. *R. coriacea*
Perianth-segments 5 to 6 mm. long, green..........47. *R. jamaicensis*
CC. Joints elliptic to oblong. Series 16, *Crispatae*.
Joints thick, coriaceous.
Joints oblong, cuneate at base.
Flowers and fruit usually solitary at areoles..........48. *R. platycarpa*
Flowers several at an areole..........49. *R. russellii*
Terminal joints short-oblong to elliptic.
Fruit red..........50. *R. elliptica*
Fruit white..........51. *R. pachyptera*
Joints thin.
Brazilian species.
Joints purplish green, obovate..........52. *R. rhombea*
Joints bright green or reddish.
Joints reddish green, the margins much crisped..........53. *R. crispimarginata*
Joints bright green, the margins slightly crisped.
Ultimate joints broad, elliptic to obovate..........54. *R. crispata*
Ultimate joints narrow, oblong to narrowly obovate..........55. *R. oblonga*
Bolivian species..........56. *R. cuneata*
AAA. Species not grouped..........57. *R. roseana*

1. **Rhipsalis mesembryanthemoides** [*] Haworth, Rev. Pl. Succ. 71. 1821.

Rhipsalis salicornioides [*] (variety B) Haworth, Suppl. Pl. Succ. 83. 1819.
Hariota mesembrianthemoides [†] Lemaire, Cact. Gen. Nov. Sp. 74. 1839.

Branches very dissimilar; main branches elongated, slender, terete, more or less setose, often bearing aërial roots, covered with short stubby branchlets; these sometimes also bearing short joints, usually less than 1 cm. long, more or less angled, often with short setae from the small areoles; flower-buds small, pinkish; flowers solitary at areoles of the branchlets, opening in early morning, rather large, 1.5 cm. broad, white or light pink; petals 5, spreading, acute; stamens about 20, erect, white; style white; stigma-lobes 3, white; fruit short-oblong, 5 mm. long, white or tinged with red.

Type locality: Not cited where published.

Distribution: Rio de Janeiro, Brazil.

The plant is common in cultivation; in nature it grows in dense masses on trunks of trees. It first flowered in cultivation in England in 1831. Its short joints have a fancied resemblance to species of *Mesembryanthemum.*

A dried specimen of Haworth's plant is still preserved in London and through the kindness of N. E. Brown we have a photograph of it.

Rhipsalis echinata was published as a synonym by Pfeiffer (Enum. Cact. 136. 1837).

Illustrations: Cact. Journ. **1:** 180; Curtis's Bot. Mag. **58:** pl. 3078; Schumann, Gesamtb. Kakteen 633. f. 98, G; Monatsschr. Kakteenk. **2:** 9; **4:** 59; Arch. Jard. Bot. Rio de Janeiro **1:** pl. 11; Goebel, Pflanz. Schild. **1:** pl. 4, f. 7; Loddiges, Bot. Cab. **20:** pl. 1920; Thomas, Zimmerkultur Kakteen 58.

Plate XXIV, figure 9, shows a fruiting plant obtained by Dr. Rose in Rio de Janeiro in 1915 (No. 20246); figure 10 shows a flowering plant sent by Alwin Berger in 1908.

2. **Rhipsalis cereuscula** Haworth, Phil. Mag. **7:** 112. 1830.

Hariota saglionis Lemaire, Cact. Aliq. 39. 1838.
Rhipsalis saglionis Otto in Walpers, Repert. Bot. *2:* 936. 1843.
Rhipsalis brachiata Hooker in Curtis's Bot. Mag. *69:* pl. 4039. 1843.
Hariota cereuscula Kuntze, Rev. Gen. Pl. *1:* 262. 1891.
Rhipsalis saglionis rubrodiscus Löfgren, Arch. Jard. Bot. Rio de Janeiro *1:* 80. 1915.

Stems and branches terete; stem slender, usually elongated, often erect, sometimes 6 dm. high, crowned by a cluster of short branches; upper branches short, 2 to 6 times as long as thick, somewhat angled, the areoles bearing 2 to 4 short bristles; flowers terminal or near the ends of the branches, 16 mm. broad; petals about 12, spreading, pinkish to white with yellowish midrib; stigma-lobes 3 or 4; berries white.

Type locality: Brazil.

Distribution: Uruguay to central Brazil.

Illustrations: Curtis's Bot. Mag. **69:** pl. 4039; Loudon, Encycl. Pl. ed. 3. 1380. f. 19408, as *Rhipsalis brachiata;* Cycl. Amer. Hort. Bailey **4:** f. 2101; Stand. Cycl. Hort. Bailey **5:** f. 3377; Cact. Journ. **1:** 180; Monatsschr. Kakteenk. **4:** 75, as *R. saglionis.*

Plate XXVII, figure 3, is of a plant which flowered in the New York Botanical Gardens in March 1912. Figure 221 is from a photograph of a flowering plant from Misiones, obtained by Dr. Rose in 1915 from Dr. Spegazzini.

3. **Rhipsalis prismatica** Rümpler in Förster, Handb. Cact. ed. 2. 884. 1885.

Hariota prismatica Lemaire, Illustr. Hort. *10:* Misc. 84. 1863.
Rhipsalis suareziana [‡] Weber, Rev. Hort. *64:* 425. 1892.
Rhipsalis tetragona Weber, Rev. Hort. *64:* 428. 1892.

Very much branched, prostrate; lower branches elongated and terete; upper branches short and somewhat angled; areoles more or less setose; flowers white; petals usually 5, obtuse; fruit small, pinkish to white, globose.

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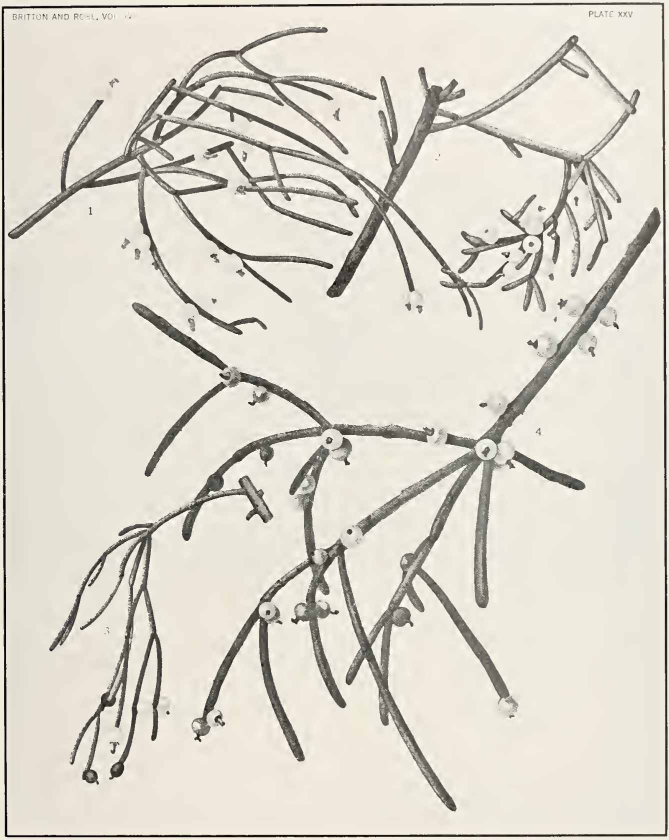
[*] Haworth spelled this *R. mesembryanthoides* and also *R. salicornoides.*

[†] The Index Kewensis gives the place of publication erroneously as Lemaire, Cact. Aliq. Nov. 39. 1838.

[‡] According to the Index Kewensis, *Rhipsalis suarensis* Weber (Dict. Hort. Bois 1046. 1898) is the same.


BRITTON AND ROSE, VOL. IV
PLATE XXV
1
2
3
4

1. Fruiting branch of *Rhipsalis heteroclada.*
2. Fruiting branch of same.
3. Fruiting branch of *Rhipsalis capilliformis.*
4. Fruiting branch of *Rhipsalis virgata.*

(All three-fourths size.)

Type locality: Not cited, but Förster and Weber state that it came from Brazil.

Distribution: Brazil and northern Madagascar, but range not known.

Weber thought that *Rhipsalis tetragona* was the same as *R. prismatica* Rümpler, but because he was not certain he described it as new.

Illustration: Gartenwelt **16:** 634, as *Rhipsalis suareziana;* Monatsschr. Kakteenk. **18:** 74, as *R. tetragona.*

Plate XXXII, figure 3, shows a plant from Berlin which flowered in the New York Botanical Garden on November 23, 1915.

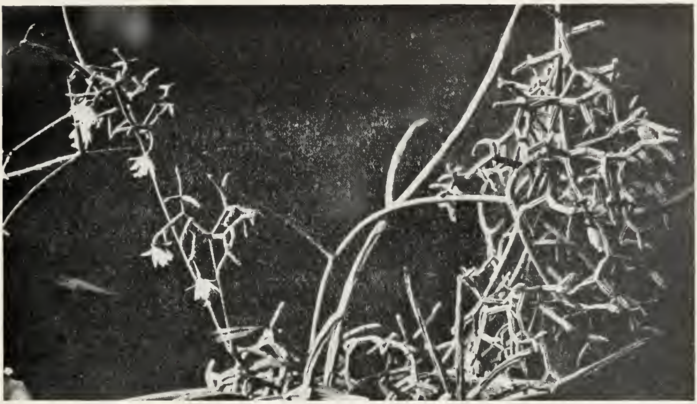


FIG. 221.—Rhipsalis cereuscula.

4. **Rhipsalis simmleri** Beauverd, Bull. Herb. Boiss. II. **7:** 136. 1907.

Stems pendent, cylindric, 2 to 3 mm. in diameter, very much branched, the branches dichotomous or 3 or 4-verticillate, upper short and somewhat angled, quite unlike lower ones; flowers solitary, subterminal; petals white with pink tips, oblong, 6 to 8 mm. long; filaments 5 to 8 mm. long, white, filiform; style exserted, 9 mm. long; stigma-lobes ovate, reflexed, white; ovary obconic, 3 to 3.5 mm. in diameter; fruit white.

Type locality: Costa Rica.

Distribution: Costa Rica.

This species is named for Paul Simmler, chief gardener of the Boissier Collections at Geneva, Switzerland. The plant was introduced in a collection of orchids from Costa Rica and flowered in cultivation. Dr. Rose saw it when in Geneva in 1912 and obtained a small fragment, but he did not see it in flower.

Illustration: Bull, Herb. Boiss. II. **7:** 137.

5. **Rhipsalis clavata** Weber, Rev. Hort. **64:** 429. 1892.

Rhipsalis clavata delicatula Löfgren, Arch. Jard. Bot. Rio de Janeiro *2:* 45. 1918.

Erect when young but soon hanging, often a meter long or more, much branched; joints all similar, narrowly clavate, sometimes 4-angled when young, short, 1 to 3 cm. long, deep green, becoming brown, produced in terminal whorls of 2 to 7; areoles few, sometimes bearing 1 to 5 white hairs; flowers near end of branches, white, 1.5 cm. long; petals hardly spreading; fruit spherical, 6 mm. in diameter, white or yellowish; seeds 1.5 cm. long.

Type locality: Petropolis, in the state of Rio de Janeiro, Brazil.

Distribution: State of Rio de Janeiro.

This species is much like *Hatiora* and it was really referred to *Hariota* at one time by Weber, himself. Schumann gives only one locality for it, but Dr. Rose found it on Corcobado in Rio de Janeiro, altitude 465 meters, growing on branches of trees, and on this plant the description has been partly based. Weber's manuscript name, *Hariota clavata,* has appeared only as a synonym of this species (Monatsschr. Kakteenk. **5:** 172. 1895).

Illustrations: Arch. Jard. Bot. Rio de Janeiro **2:** pl. 17, as *Rhipsalis clavata delicatula:* Arch. Jard. Bot. Rio de Janeiro **1:** pl. 13; Möllers Deutsche Gärt. Zeit. **25:** f. 11, No. 16.

6. **Rhipsalis campos-portoana** Löfgren, Arch. Jard. Bot. Rio de Janeiro **2:** 35. 1918.

Stem slender, terete, usually pendent, usually dichotomous; primary branches elongated; terminal branches in 2's or 4's, somewhat clavate, 3 to 5 cm. long; areoles few, naked; flowers terminal or usually so, white; petals about 8, slightly spreading, obtuse, up to 9 mm. long; fruit globose, 4 mm. in diameter, red.

Type locality: Serra de Itatiaya, Brazil.

Distribution: Known only from the type locality.

This plant was collected by Dr. Rose and Campos Porto in July 1915 (No. 20612) and flowered in the Jardin Botanico do Rio de Janeiro in September of that year, and from this the description was drawn. Dr. Rose brought home living specimens but these have not yet flowered.

Illustration: Arch. Jard. Bot. Rio de Janeiro **2:** pl. 7.

7. **Rhipsalis heteroclada** nom. nov.

Stems stiff, dark green, but purple about areoles and tips of branches, often erect in cultivation, much branched toward top of plant; branches often in verticillate clusters, much more slender than the main stem, 1 to 2 mm. in diameter; areoles small, often bearing a single bristle; flowers small, white or greenish; petals 5, obtuse, spreading or recurved; filaments about 20, white, erect; style white, sunken at base into a little cup; stigma-lobes 3, white; ovary green, about 2 mm. long; fruit globose, 5 to 6 mm. in diameter, white.

This plant is very common in Brazilian collections, where it is planted on fruit trees. Dr. Rose found some beautiful examples in the Horto Bolanco Paulista. near Sao Paulo, and on Ilha Grande (Rose 20371, type).

Plate XXIII, figure 2, shows a fruiting branch obtained by Dr. Rose in Rio de Janeiro; plate XXV, figure 1 and 2, shows fruiting plants collected by Dr. Rose in Rio de Janeiro; plate XXXII, figure 1, shows a fruiting plant obtained by Dr. Rose in Rio de Janeiro.

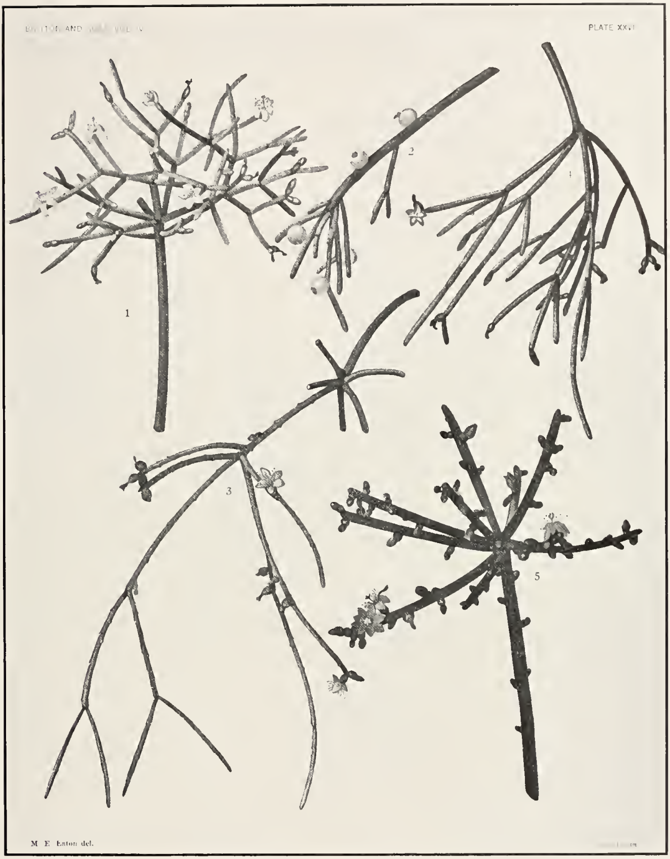
8. **Rhipsalis capilliformis** Weber, Rev. Hort. **64:** 425. 1892.

Rhipsalis gracilis N. E. Brown, Gard. Chron. III. *33:* 18. 1903.

Stems and branches very slender and weak, the main branches often much elongated, the branchlets short, spreading or drooping; flowers numerous, scattered along sides of branches, cream-colored. rotate, 5 to 6 mm. broad; petals few, sometimes only 5, short and obtuse; fruit globose, naked, white or pinkish, 4 to 5 mm. in diameter; seeds very numerous.

Type locality: Not cited.

Distribution: Eastern Brazil, but not known to us in the wild state.



1. Flowering branch of *Rhipsalis cribrata.*
2. Fruiting branch of *Rhipsalis capilliformis.*
3. Flowering branch of same.
4. Flowering branch of same.
5. Flowering branch of *Rhipsalis teres.*

(All three-fourths size.)

This is a very attractive little plant, often forming a dense mass of delicate branches. It is a rather shy bloomer, but grows well in damp greenhouses.

Illustration: Gartenwelt **13:** 117.

Plate XXVI, figure 4, is from a plant obtained in the Botanical Garden at Brussels by Dr. Rose in 1912, which flowered and fruited in Washington in 1919; figure 3 shows a plant sent from Paris, France, which flowered in the New York Botanical Garden in 1911 (No. 14795); figure 2 is from a plant sent by R. Lamb, from Manchester, England; plate XXV, figure 3, shows a fruiting plant sent from Paris in 1901.

9. **Rhipsalis burchellii** nom. nov.

Rhipsalis cribrata Löfgren, Arch. Jard. Bot. Rio de Janeiro *1:* 81. pl. 10. 1915. Not Rümpler, 1885.

Much branched, very weak, with long slender hanging branches, the branching usually dichotomous; ultimate branches usually 4 to 10 cm. long; flowers subterminal, campanulate, 10 to 12 mm. long, white; fruit turbinate, rose-colored.

This plant is very common in the forests about Sao Paulo. Dr. Rose collected it in the forest of Jabaquara, August 15, 1915 (No. 20857, type), and also in the Botanical Garden of Museu Paulista on August 14, 1915 (No. 20849).

This species is named for William John Burchell (1781-1863), who went to Brazil in 1825, where he made large and valuable collections.

Plate XXVII, figure 2, shows a fruiting branch taken from Dr. Rose's plant No. 20857.

10. **Rhipsalis cribrata** (Lemaire) Rümpler in Förster, Handb. Cact. ed. 2. 889. 1885.

Hariota cribrata Lemaire, Illustr. Hort. *4:* Misc. 12. 1857.
Rhipsalis pendula Vöchting, Jahrb. Wiss. Bot. Leipzig *9:* 371. 1873. Not Pfeiffer, 1837.
Rhipsalis penduliflora N. E. Brown, Gard. Chron. II. *7:* 716. 1877.
Hariota penduliflora Kuntze, Rev. Gen. Pl. *1:* 263. 1891.
Rhipsalis cribrata filiformis Engelhardt in Möllers, Deutsche Gärt. Zeit. *18:* 585. 1903.

Woody at base, much branched; branches of two forms; stems terete, elongated, at first erect, then hanging, without aërial roots; terminal branches very short, 2 to 3 cm. long, usually in whorls of 2 to 20; areoles small, often with 1 or 2 small setae; flowers generally terminal, pendulous, white or cream-colored, 8 to 10 mm. long; petals usually 5 to 7, obtuse, drying yellow; filaments erect, numerous, white, salmon-colored at base; style white; stigma-lobes 3 or 4, spreading, white; ovary naked; fruit small, globose, 2 to 3 mm. in diameter, pinkish, terminated by the old perianth.

Type locality: Brazil.

Distribution: States of Minas Geraes, Rio de Janeiro, and Sao Paulo, Brazil.

This species was introduced into Europe in 1856 from Brazil, as some of the other species have been, through sendings of orchids, where it was discovered by Lemaire, and when it flowered the following year it was named and described by him.

Hariota penduliflora (Monatsschr. Kakteenk. **1:** 69. 1891) is listed but not described.

Rhipsalis penduliflora laxa, referred to by Schumann (Martius, Fl. Bras. 4^2 276. 1890), comes from the gardens at Kew.

Illustrations: Möllers Deutsche Gärt. Zeit. **18:** 585, as *Rhipsalis cribrata filiformis;* Blühende Kakteen **1:** pl. 27, A; Arch. Jard. Bot. Rio Janeiro **1:** pl. 9, as *R. penduliflora.*

Plate XXIII, figure 3, shows a fruiting branch collected by Dr. Rose in Rio de Janeiro in 1915; plate XXVI, figure 1, shows a flowering branch obtained by Dr. Rose in Rio de Janeiro.

11. **Rhipsalis cassutha** * Gaertner, Fruct. Sem. **1:** 137. 1788.

Cassytha filiformis Miller, Gard. Dict. ed. 8. 1768. Not Linnaeus, 1753.
Cactus parasiticus Lamarck, Encycl. *1:* 541. 1783. Not Linnaeus, 1768.
Cactus pendulus Swartz. Prodr. 77. 1788.

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* The original spelling given by Gaertner is as above. The usual spelling, however, is *R. cassytha.*

Rhipsalis parasitica Haworth, Syn. Pl. Succ. 187. 1812.
Cactus caripensis * Humboldt, Bonpland, and Kunth, Nov. Gen. et Sp. *6:* 66. 1823.
Cereus caripensis De Candolle, Prodr. *3:* 467. 1828.
Rhipsalis cassytha dichotoma De Candolle, Prodr. *3:* 476. 1828.
Rhipsalis cassytha mauritiana † De Candolle, Prodr. *3:* 476. 1828.
Rhipsalis cassytha mociniana De Candolle, Prodr. *3:* 476. 1828.
Rhipsalis cassytha hookeriana De Candolle, Prodr. *3:* 476. 1828.
Rhipsalis cassytha swartziana De Candolle, Mém. Mus. Hist. Nat. Paris *17:* 80. 1828.
Rhipsalis dichotoma G. Don, Hist. Dichl. Pl. *3:* 176. 1834.
Rhipsalis hookeriana G. Don, Hist. Dichl. Pl. *3:* 176. 1834.
Rhipsalis cassythoides G. Don, Hist. Dichl. Pl. *3:* 176. 1834.
Rhipsalis cassutha pendula Salm-Dyck in Pfeiffer, Enum. Cact. 134. 1837.
Rhipsalis undulata Pfeiffer, Enum. Cact. 136. 1837.
Hariota cassytha Lemaire, Cact. Gen. Nov. Sp. 75. 1839.
Cereus parasiticus Haworth in Steudel, Nom. ed. 2. 1: 335. 1840.
Rhipsalis aethiopica Welwitsch, Journ. Linn. Soc. Bot. *3:* 152. 1859.
Rhipsalis minutiflora Schumann in Martius, Fl. Bras. 4^2: 271. 1890.
Hariota parasitica Kuntze, Rev. Gen. Pl. *1:* 262. 1891.
Rhipsalis comorensis Weber, Rev. Hort. *64:* 424. 1892.
Rhipsalis zanzibarica ‡ Weber, Rev. Hort. *64:* 425. 1892.

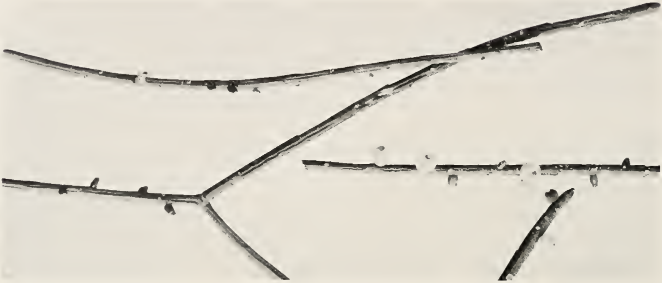

Fig. 222.—Rhipsalis cassutha.

Epiphytic or saxicolous, usually growing on trunk or branches of large trees, hanging in large clusters, 1 to 9 meters long, the branches weak and pendent; branches when young bearing 5 to 9 white bristles at the areoles, when old naked, terete, sometimes producing aërial roots, often only 3 mm. in diameter, light green, usually growing from tips of other branches, generally in pairs but sometimes in clusters of 6 or 8; flowers lateral, solitary, small, greenish in bud, sometimes subtended by a single bristle; petals 2 mm. long, cream-colored; stamens borne on disk; ovary exserted; fruit naked, white or pink, maturing a few days after flowering, globose, 5 mm. in diameter.

Type locality: Not cited.

Distribution: Florida, Mexico, Central America, West Indies, Panama to Dutch Guiana, eastern and southern Brazil, Colombia, Eucador, Bolivia, and Peru, also in Ceylon and tropical Africa.

The fruit of *Rhipsalis cassutha,* while usually white, is sometimes described as red or pinkish. Hooker, in his Exotic Flora, figured and described the fruit as flesh-colored. Weber, who received a red-fruited form from Costa Rica, has named it variety *rhodocarpa* (Dict. Hort. Bois 1046. 1898). In the West Indies the plants inhabit moist districts and are most abundant in forests, but in the vicinity of Matanzas, Cuba, occur on cliffs.

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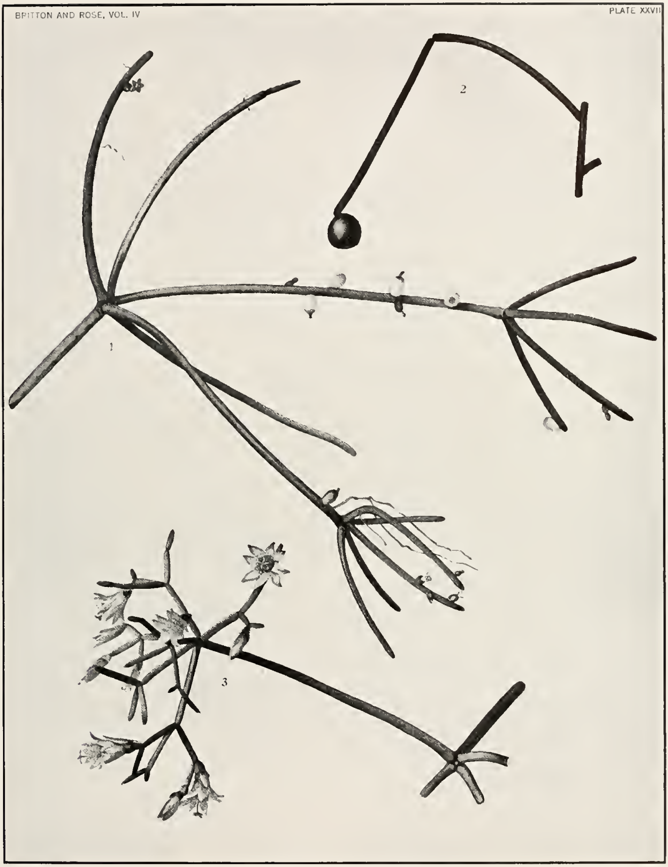
* This name was written *Cactus garipensis* by Kunth (Syn. Pl. Aeq. 3: 370. 1824) and is so listed in the Index Kewensis.

† De Candolle gives *Cactus pendulinus* Sieber (Fl. Maur. 2. n. 259) as a synonym of this variety.

‡ Schumann (Gesamtb. Kakteen 623) spells the name *Rhipsalis sansibarica.*


BRITTON AND ROSE, VOL. IV
PLATE XXVII
1
2
3

1. Flowering and fruiting branch of *Rhipsalis cassutha.*
2. Fruiting branch of *Rhipsalis burchellii.*
3. Flowering branch of *Rhipsalis cereuscula.*

(All three-fourths size.)

Hitherto unknown wild within the continental United States, the plant was found on August 5, 1923, by C. A. Mosier on trees in Wallenstein's Hammock, Dade County, Florida.

Cactus cassythoides Mociño and Sessé was given by De Candolle (Prodr. **3**: 476. 1828) as a synonym of *R. cassytha mociniana.*

Löfgren (Arch. Jard. Bot. Rio de Janeiro **2**: 40. pl. 11. 1918) has figured and described as new a plant under the name of *Rhipsalis cassythoides* which may belong here. The name had already been used by Don and we have referred it as a synonym of *R. cassutha.*

Cactus epidendrum Linnaeus (Amoen. Acad. **8**: 257. 1785) is without description and has been referred to *Rhipsalis undulata.* It was from Surinam.

Cereus bacciferus (Hemsley, Biol. Centr. Amer. Bot. **1**: 548. 1880) appears only as a synonym of *Rhipsalis cassutha.*

Cassytha baccifera Miller (De Candolle, Prodr. **3**: 476. 1828) and *C. polysperma* Aiton (Gaertner, Fruct. Sem. Pl. **1**: 137. 1788) are known in synonymy only.

Rhipsalis pendula Hortus (Pfeiffer, Enum. Cact. 133. 1837) occurs only as a synonym.

Rhipsalis caripensis Weber is listed as one of the synonyms of this species by Schumann (Gesamtb. Kakteen 622. 1898).

Rhipsalis cassytha vars. *major* and *pilosiuscula* (Salm-Dyck. Hort. Dyck. 228. 1834) and var. *tenuior* (Schumann, Monatsschr. Kakteenk. **1**: 78. 1891) are only names. The first has been referred to *R. floccosa,* while the second is sometimes referred to *R. pulvinigera.*

Illustrations: De Tussac, Fl. Antill. **3**: pl. 22, as *Cactus pendulus:* Plunkenet, Phyt. pl. 172, f. 2. 1692, as *Cuscuta baccifera,* etc.; De Candolle, Mém. Mus. Hist. Nat. Paris **17**: pl. 21; Förster, Handb. Cact. ed. 2. 888. f. 121, as *Rhipsalis cassytha mociniana;* Ann. Inst. Roy. Hort. Fromont **2**: pl. 3, as *R. parasitica;* Arch. Jard. Bot. Rio de Janeiro **2**: pl. 11, as *R. cassythoides;* Gartenwelt **13**: 117, as *R. minutiflora;* Möllers Deutsche Gärt. Zeit. **25**: 477. f. 11, No. 18, as *R. sansibarica;* (Hortus malabaricus pl. 7, *fide* Miller) ; Gaertner, Fruct. Sem. Pl. **1**: pl. 28, f. 1; Torreya **9**: 154. f. 1; Ann. Rep. Smiths. Inst. **1908**: 537. f. 1; Journ. N. Y. Bot. Gard. **11**: f. 23; Loudon, Encycl. Pl. 413. f. 6907; Loddiges, Bot. Cab. **9**: pl. 865; Goebel, Pflanz. Schild. **1**: pl. 4, f. 2; Karsten, Deutsche Fl. 887. f. 501, No. 5; ed. 2, **2**: 456. f. 605, No. 5; Stand. Cycl. Hort. Bailey **2**: f. 712; Nov. Act. Nat. Cur. **19**: pl. 16. f. 13; Hooker, Exot. Fl. **1**: pl. 2; Curtis's Bot. Mag. **58**: pl. 3080; Gartenwelt **16**: 633.

Plate XXVII, figure 1, shows a plant received from the Hope Botanical Garden in Jamaica. Figure 222 is from a photograph showing branches of a plant sent us from R. Lamb's collection at Manchester, England.

12. **Rhipsalis virgata** Weber, Rev. Hort. 64: 425. 1892.

Main stem or branches 1 meter long or more; terete, about 5 mm. thick, erect or ascending but in time often pendent, often bearing aërial roots; upper branches short, 1 to 6 cm. long, terete; areoles small, a little hairy, often with a white or pinkish bristle subtended by a minute bract; flowers borne along sides of the 2 and 3-year old branches, solitary at areoles, rotate, 8 to 10 mm. broad, open throughout day; outer perianth-segments few, ovate, greenish yellow, sometimes tinged with red; inner perianth-segments 4 to 6, oblong, cream-colored, obtuse; filaments erect, white; style white, about as long as stamens; stigma-lobes 3, white; ovary broader than high, crowned by a circle of scales and bearing one on the side.

Type locality: Described from a garden plant supposed to have come from Brazil.

Distribution: Eastern Brazil.

Illustration: Möllers Deutsche Gärt. Zeit. **25**: 477. f. 11, No. 12.

Plate XXV, figure 4, shows a plant, received from M. Simon of St. Ouen, Paris, in 1901, which flowered and fruited in the New York Botanical Garden in 1916.

13. **Rhipsalis teres** (Vellozo) Steudel, Nom. ed. 2. 2: 449. 1841.

Cactus teres Vellozo, Fl. Flum. 207. 1825.
Rhipsalis conferta Salm-Dyck, Cact. Hort. Dyck. 1849. 229. 1850.
Hariota conferta Kuntze, Rev. Gen. Pl. *1:* 262. 1891.
Hariota teres Kuntze, Rev. Gen. Pl. *1:* 263. 1891.

Stems erect or spreading, woody at base, 10 to 12 mm. in diameter, much branched, especially above, with 5 to 12 short ultimate branches at top of main ones; old branches terete, green or blotched with red; flowers usually several at top of short terminal branches and scattered all along the primary ones, 10 to 12 mm. broad, pale yellow; petals widely spreading; filaments and style white, erect.

Type locality: Brazil.

Distribution: States of Minas Geraes, Rio de Janeiro, and Sao Paulo, Brazil.

Rhipsalis floribunda Schott was given by Schumann (Martius, Fl. Bras. 4^2: 274. 1890) as a synonym of this species.

Illustrations: Vellozo, Fl. Flum. **5**: pl. 30, as *Cactus teres:* Möllers Deutsche Gärt. Zeit. **25**: 477. f. 11, No. 22; Garten-Zeitung **4**: 182. f. 42, No. 7, as *Rhipsalis conferta.*

Plate XXVI, figure 5, shows a plant received from Kew in 1902 which flowered in the New York Botanical Garden in 1917.

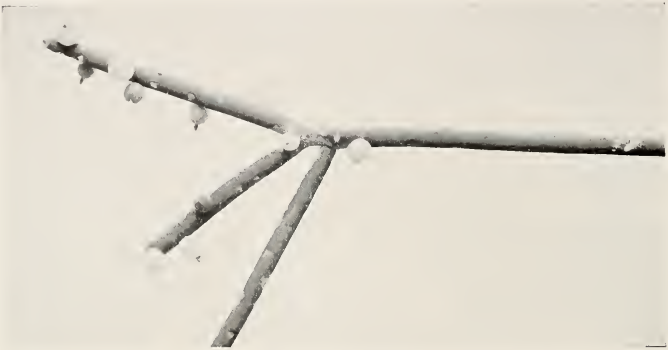


FIG. 223.—Rhipsalis shaferi.

14. **Rhipsalis lindbergiana** Schumann in Martius, Fl. Bras. 4^2: 271. 1890.

Rhipsalis erythrocarpa Schumann in Engler, Pflanzenw. Ost. Afrikas 282. 1895.
Hariota lindbergiana Kuntze, Rev. Gen. Pl. 3^2: 107. 1898.
Rhipsalis densiareolata Löfgren, Arch. Jard. Bot. Rio de Janeiro *2:* 41. 1918.

Very much branched, hanging from tree-trunks in great festoons, 1 to 2 meters long; joints elongated, 3 to 5 mm. in diameter; areoles filled with hairs and 2 bristles; flowers numerous, lateral, pinkish; ovary naked or nearly so; fruit light red, globose, 2 to 3 mm. in diameter, 16 to 20-seeded.

Type locality: Near the city of Rio de Janeiro.

Distribution: Mountainous regions in the state of Rio de Janeiro, Brazil, and Mount Kilman-Djaro, Africa.

Rhipsalis erythrocarpa Schumann was described from herbarium specimens, collected on Mount Kilman-Djaro, in tropical Africa. We refer it to *R. lindbergina* Schumann in deference to the opinion of Mr. Roland-Gosselin * but we have not had specimens for study.

Illustrations: Arch. Jard. Bot. Rio de Janeiro **2**: pl. 12, as *Rhipsalis densiareolata.* Rev. Hort. **85**: f. 152, in part, as *R. erythrolepis;* Martius, Fl. Bras. 4^2: pl. 53; Arch. Jard; Bot. Rio de Janeiro **1**: pl. 4.

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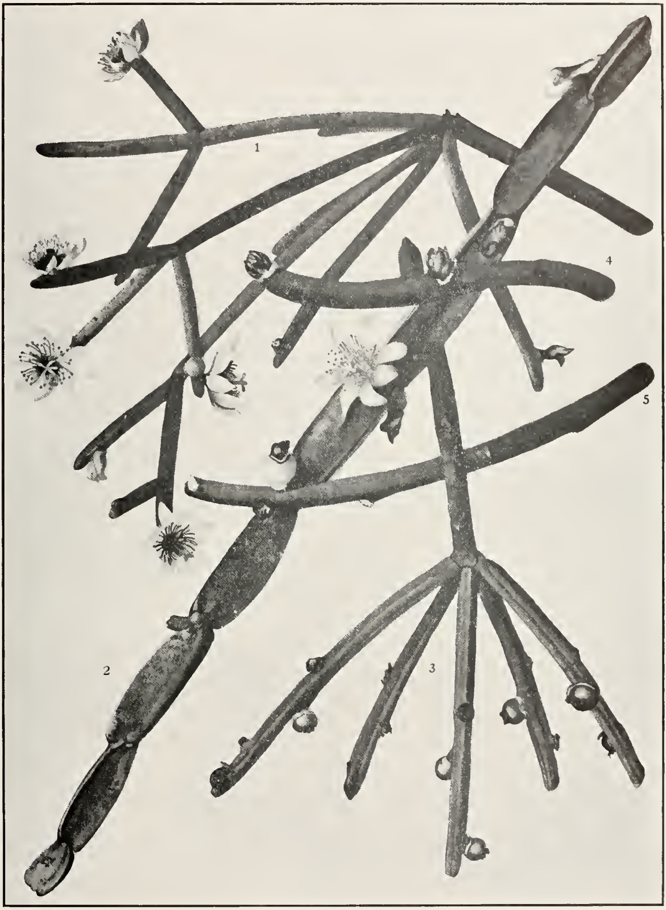
* Bull. Soc. Bot. France *59:* 100.



1. Flowering branch of *Rhipsalis neves-armondii.*
2. Flowering branch of *Rhipsalis paradoxa.*
3. Fruiting branch of *Rhipsalis pulvinigera.*
4. Flowering branch of *Rhipsalis tucumanensis.*
5. Fruiting branch of same.

(All three-fourths size.)

Plate XXI, figure 4, shows a branch from the plant collected by Dr. Rose on Tijuca in 1915 (No. 21174); figure 2 shows another plant collected by him in Rio de Janeiro, Brazil (No. 20309).

15. Rhipsalis shaferi sp. nov.

Stems at first stiff, erect or ascending, afterwards spreading or procumbent, 4 to 5 mm. thick, terete, green or more or less purplish at tips; juvenile and lower branches often bearing several bristles at areoles; upper branches without bristles or with a single appressed one; scales subtending the areoles small but broad; flowers numerous, scattered all along side of branch, solitary (rarely in pairs) at areoles, small, rotate, greenish white, 8 to 10 mm. broad; petals 5 or 6, short-oblong, obtuse; filaments greenish, erect; stigma-lobes 4, white; ovary not sunken in branch; fruit small, globose, 2 to 3 mm. in diameter, white or sometimes tinged with pink.

Collected by John A. Shafer on trees at Asunción, Paraguay, March 18, 1917 (No. 139), on trees at Trinidad, Paraguay, March 17, 1917 (No. 134, type), again in Paraguay (Nos. 145 and 147), and on trees at Posados, Misiones, Argentina (No. 131).

Plate XXIV, figure 7, shows a branch in flower; plate XXI, figure 3, shows a branch in fruit of the type which flowered in the New York Botanical Garden in 1921. Figure 223 is from a photograph of Shafer's No. 131, which flowered and fruited in Washington in 1921.

16. Rhipsalis fasciculata (Willdenow) Haworth, Suppl. Pl. Succ. 83. 1819.

Cactus fasciculatus Willdenow, Enum. Pl. Suppl. 33. 1813.
Rhipsalis horrida Baker, Journ. Linn. Soc. *21:* 347. 1884.
Rhipsalis madagascarensis Weber, Ind. Sem. Hort. Paris 1889; Rev. Hort. *64:* 424. 1892.
Hariota fasciculata Kuntze, Rev. Gen. Pl. *1:* 262. 1891.
Hariota horrida Kuntze, Rev. Gen. Pl. *1:* 263. 1891.

Stems woody, terete, much branched; branchlets clavate to cylindric, faintly ribbed when old, 4 mm. in diameter, with numerous areoles, each with a cluster of fragile hairs 3 to 4 mm. long; flowers lateral but not described; ovary not sunken in the branch; fruit globose, small, bearing a few areoles, these pubescent and setose.

Type locality: Not cited.

Distribution: Brazil and Madagascar.

We have studied Madagascan specimens of this plant sent from Kew and one sent from Bahia, Brazil, to Dr. Rose by L. Zehntner in 1920. De Candolle (Plantes Grasses **1**: pl. 59) states that it occurred in Santo Domingo. Roland-Gosselin * says that it inhabits American Islands; our very extensive explorations in the West Indies have failed to discover it. The Brazilian plant differs only from the Madagascan by having fewer hairs at the areoles.

Rhipsalis pilosa Weber is listed by Schumann (Martius, Fl. Bras. 4^2: 300. 1890) with the statement that it occurs in P. Rebut's Catalogue without description; A. Berger in a letter (dated March 7, 1920) states that this name is said to be a synonym of *R. madagascarensis*. It is illustrated (Möllers Deutsche Gärt. Zeit. **25**: 477. f. 11, No. 20). *Rhipsalis madagascarensis dasycerca* Weber is listed by R. Lamb (Collection of Cacti 73. 1908.)

Illustrations: De Candolle, Pl. Succ. **1**: pl. 59, as *Cactus parasiticus;* Curtis's Bot. Mag. **58**: pl. 3079; Gartenwelt **13**: 117, Ann. Inst. Roy. Hort. Fromont **2**: pl. 1, f. G, as *R. fasciculata;* Loudon, Encycl. Pl. 413. f. 6908, as *R. parasitica.*

17. Rhipsalis pulchra Löfgren, Arch. Jard. Bot. Rio de Janeiro 1: 75. 1915.

Stems much branched, often pendent; branches often in whorls of 3's or 4's, 3 to 4 mm. in diameter, bright green; areoles minute, reddish; flowers few, usually from near the tips of terminal branches, purplish red, large, 12 to 14 mm. long; petals oblong, obtuse; stigma-lobes white; ovary purplish red.

Type locality: Serra da Mantiquerira, Brazil.

Distribution: State of Rio de Janeiro.

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* Bull. Soc. Bot. France *59:* 99.

Our living specimens came from the Organ Mountains, Rio de Janeiro, Brazil, obtained by J. N. Rose through Ph. Luetzelburg, September 21, 1915 (No. 21157).

Dr. Rose examined the type collected by A. O. Darby in 1915 in the Museu Paulista and obtained a fragment of it through the kindness of the Director.

Rhipsalis pulcherrima Löfgren (Monatsschr. Kakteenk. **9**: 136. 1899) seems to have been the name first given to this plant.

Illustration: Arch. Jard. Bot. Rio de Janeiro **1**: pl. 5.

Plate XXXI, figure 2, shows a flowering branch of the plant obtained by Dr. Rose in 1915 which flowered in the New York Botanical Garden in 1918 (No. 21151).

18. Rhipsalis lumbricoides Lemaire, Illustr. Hort. 6: Misc. 68. 1859.

Cereus lumbricoides Lemaire, Cact. Gen. Nov. Sp. 60. 1839.
Rhipsalis sarmentacea Otto and Dietrich, Allg. Gartenz. *9:* 98. 1841.
Lepismium sarmentaceum Vochting, Jahrb. Wiss. Bot. Leipzig *9:* 399. 1873.
Hariota lumbricalis Kuntze, Rev. Gen. Pl. *1:* 263. 1891.
Hariota sarmentacea Kuntze, Rev. Gen. Pl. 3^2: 107. 1898.

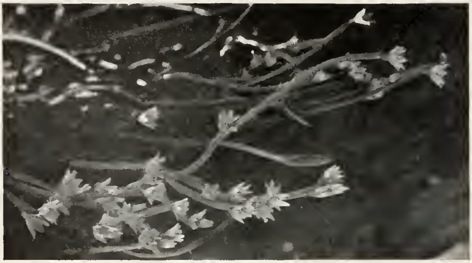


Fig. 224.—Rhipsalis lumbricoides.

Stems terete when growing, but angled when dormant, 3 to 4 meters long, about 6 mm. thick, rooting freely, much branched; young growth with 5 to 10 white bristles from each areole, usually spreading, but old branches naked; flowers white to cream-colored, sometimes tinged with green; petals few, often only 5, lanceolate, acute, 10 to 12 mm. long, acuminate; style slender, greenish, longer than the stamens; stigma-lobes 4, spreading, greenish; ovary naked; fruit white.

Type locality: Montevideo, Uruguay.

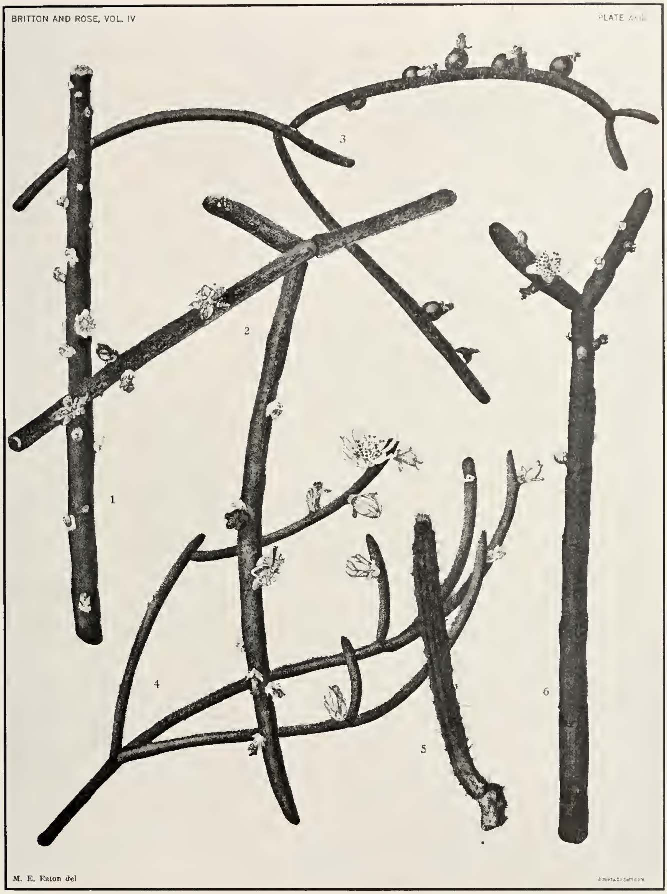
Distribution: Uruguay and Paraguay, also probably southern Brazil. Hooker says that it is a native of Buenos Aires, but this is doubtless an error.

This plant flowered in Washington on March 16, 1915. Schumann's drawing of the flower is not very good.

Rhipsalis sarmentosa (Monatsschr. Kakteenk. **4**: 46. 1894) and *R. larmentacea* (Illustr. Hort. **6**: 88. 1859) are misspellings for *R. sarmentacea.*

According to Lemaire (Cact. Gen. Nov. Sp. 60. 1839) *Cereus flagelliformis minor* Salm-Dyck (Hort. Dyck. 64. 1834) belongs here. Grisebach (Symb. Fl. Argen. 139) referred *Cereus donkelaarii* here.

Illustrations: Martius, Fl. Bras. 4^2: pl. 59; Curtis's Bot. Mag. **85**: pl. 5136; Dict. Gard. Nicholson **4**: 598. f. 60; Suppl. 635. f. 646; Engler and Prantl, Pflanzenfam. 3^{6a}: f. 69, D, E; Gard. Chron. III. **2**: 465. f. 95; Watson, Cact. Cult. 232. f. 90; ed. 3. f. 66, as *Rhipsalis sarmentacea;* Schumann, Gesamtb. Kakteen 633. f. 98, F; Arch. Jard. Bot. Rio de Janeiro **1**: pl. 3; Gartenwelt **13**: 117.



1. Flowering branch of *Rhipsalis floccosa*.
2. Flowering branch of same.
3. Fruiting branch of *Rhipsalis puniceo-discus*.
4. Flowering branch of *Rhipsalis gibberula*.
5. Branch of *Rhipsalis dissimilis*.
6. Flowering and fruiting branch of same.

(All three-fourths size.)

Figure 224 is from a photograph taken by H. Buch which was given to Dr. Rose when he was in La Plata, Argentina, in 1915.

19. Rhipsalis aculeata Weber, Rev. Hort. **64:** 428. 1892.

Stems terete, 3 to 4 mm. in diameter, somewhat angled and roughened in dried specimens; areoles close together, bearing wool and 8 to 10 appressed white bristles or spines; fruit not immersed, globose, 7 to 8 mm. in diameter, dark purple to nearly black, either naked or with 3 or 4 hairy areoles.

Type locality: Catamarca, Argentina.

Distribution: Northern Argentina, in the provinces of Catamarca and Tucuman.

A round-stemmed species collected by Otto Kuntze on the Sierra de Santa Cruz, Bolivia, and labeled *Hariota sarmentacea* may belong here.

This species is described by Schumann as 8 to 10-ribbed, but no ribs are shown in growing plants; in drying the branches are somewhat angled but one could hardly describe them as ribbed. Dr. Shafer made a single collection of this plant at Tucuman in 1917 (No. 92); part of this material is living in the New York Botanical Garden. Dr. Rose also obtained a specimen through one of his Argentina correspondents from Catamarca.

Plate XXIV, figure 8, is from Dr. Shafer's plant mentioned above.

20. Rhipsalis grandiflora Haworth, Suppl. Pl. Succ. 83. 1819.

Cactus funalis Sprengel, Syst. *2:* 479. 1825.
Cactus cylindricus Vellozo, Fl. Flum. 207. 1825. Not Lamarck, 1783. Not Ortega, 1800.
Rhipsalis funalis Salm-Dyck in De Candolle, Prodr. *3:* 476. 1828.
Hariota funalis Lemaire, Cact. Gen. Nov. Sp. 74. 1839.
Rhipsalis cylindrica Steudel, Nom. ed. 2. *2:* 448. 1841.
Hariota cylindrica Kuntze, Rev. Gen. Pl. *1:* 262. 1891.
Hariota grandiflora Kuntze, Rev. Gen. Pl. *1:* 262. 1891.
Rhipsalis robusta Lindberg, Monatsschr. Kakteenk. *6:* 53. 1896. Not Lemaire, 1860.
Rhipsalis hadrosoma Lindberg, Monatsschr. Kakteenk. *6:* 96. 1896.

Branches divaricate, often reddish, especially about the areoles, stout, 8 to 10 mm. in diameter; flowers numerous, scattered all along branches, 12 mm. long, 2 cm. broad, light rose or cream-colored; sepals reddish; petals few, oblong, obtuse, widely spreading; anthers and style white; stigma-lobes 4, white; fruit naked, purplish, 6 to 7 mm. in diameter.

Type locality: Not cited.

Distribution: State of Rio de Janeiro, Brazil.

We have not seen the type specimen of this species, but through the kindness of Mr. N. E. Brown of Kew we have seen a photograph of Haworth's specimens, which are the same as the species here described. Haworth's plant was received from Brazil in 1816, sent by Messrs. Bowie and Cunningham.

Rhipsalis calamiformis (Pfeiffer, Enum. Cact. 135. 1837) was published as a synonym of *R. funalis*.

Walpers gives *Rhipsalis funalis gracilior* Pfeiffer (Repert. Bot. **2:** 279. 1843) as a synonym.

Illustrations: Gartenwelt **13:** 117; Watson, Cact. Cult. 228. f. 89; ed. 3. f. 65; Amer. Gard. **11:** 465; Dict. Gard. Nicholson **3:** 289. f. 365; Gartenflora **42:** 234. f. 48; Link and Otto, Icon, Pl. Rar. pl. 38, as *Rhipsalis funalis;* Vellozo, Fl. Flum. **5:** pl. 31, as *Cactus cylindricus;* Monatsschr. Kakteenk. **6:** 55, as *R. robusta;* Blühende Kakteen **3:** pl. 141; Monatsschr. Kakteenk. **7:** 151. f. 1 to 8; Arch. Jard. Bot. Rio de Janeiro **1:** pl. 7, as *R. hadrosoma;* Curtis's Bot. Mag. **54:** pl. 2740; Schumann, Gesamtb. Kakteen 633. f. 98, A; Martius, Fl. Bras. 4^2: pl. 54; Monatsschr. Kakteenk. **7:** 151. f. 9 to 11; Arch. Jard. Bot. Rio de Janeiro **1:** pl. 6.

Plate XXXI, figure 3, shows a plant collected by Dr. Rose near Rio de Janeiro in 1915 (No. 20746) which flowered in the New York Botanical Garden in 1918; figure 1 is of a plant which also flowered in the New York Botanical Garden, April 3, 1912; plate XXI, figures 1 and 6, shows the flowers and fruit of specimens sent by Alwin Berger in 1908.

21. **Rhipsalis megalantha** Löfgren, Monatsschr. Kakteenk. **9:** 134. 1899.

Rhipsalis novaesii Gürke, Monatsschr. Kakteenk. *19:* 12. 1909.

Plants stout, up to 1 cm. thick, at first erect but in time spreading or with pendent branches, dull green, often spotted with purple; areoles rather prominent, especially after flowering; flowers large, 4 cm. broad; petals 8 to 12, oblong, often shortly acuminate or obtuse, white; filaments erect, orange at base, rose-colored above; style thick, longer than the stamens; stigma-lobes 6 to 8; fruit surrounded with white hairs, rather small, 6 mm. in diameter, white or tinged with red; seeds nearly black.

Type locality: Island of Sao Sebastiao, Brazil.

Distribution: Known only from the type locality, an island off the coast of Brazil, belonging to the state of Sao Paulo.

This plant is known wild only from the collection of Dr. Löfgren, but is now widely found in cultivation, sometimes under the names *Rhipsalis grandiflora* or *R. nevaesii.* It has the largest flower of any species of *Rhipsalis.*

Illustrations: Blühende Kakteen **2:** pl. 116; Monatsschr. Kakteenk. **19:** 13, as *Rhipsalis novaesii;* Monatsschr. Kakteenk. **9:** 137; Schumann, Gesamtb. Kakteen Nachtr. 147. f. 35; Arch. Jard. Bot. Rio de Janeiro **1:** pl. 8.

Plate XXIV, figure 3, shows a fruiting branch obtained by Dr. Rose in Rio de Janeiro, Brazil, in 1915 (No. 20400).

22. **Rhipsalis leucorhaphis** Schumann, Monatsschr. Kakteenk. **10:** 125. 1900.

Epiphytic, much branched, about 5 dm. long, rooting abundantly along the branches, jointed, 5 to 8 mm. in diameter, terete or showing 4 or 5 ribs in herbarium specimens; bristles 1 to 5, appressed, early deciduous; areoles subtended by an ovate papery bract; flowers white, nodding, large, 1.5 cm. long; petals only slightly spreading; filaments purplish or white with orange-colored base; stigma-lobes 3 or 4, greenish, spreading; ovary not sunken in the branch; fruit globose, bright red, 6 to 8 mm. in diameter; seeds numerous, brown.

Type locality: Estancia Tagatiya, Paraguay.

Distribution: Paraguay and northern Argentina.

We did not know this species until it was brought back by Dr. Shafer in 1917 from Paraguay, where he obtained good specimens; he also found it abundant in northern Argentina. Like many of the other species it grows in various situations, sometimes sprawling over rocks or growing on forest trees. One of his living plants fruited in the New York Botanical Garden and from this we have drawn part of our description.

Plate XXIV, figure 1, shows the plant in flower, and figure 2 shows it in fruit, collected by Dr. Shafer at Trinidad, Paraguay (No. 143).

23. **Rhipsalis loefgrenii** nom. nov.

Rhipsalis novaesii Löfgren, Arch. Jard. Bot. Rio de Janeiro *1:* 69. 1915. Not Gürke, 1909.

Stems long and slender, rooting freely all along stem, pale green to purple, terete, 3 mm. in diameter; areoles small, subtended by a large scarious bract with appressed hairs in axils when young; flowers very numerous, 12 to 15 mm. long, white, campanulate; filaments purplish at base; fruit purplish, 5 to 8 mm. in diameter.

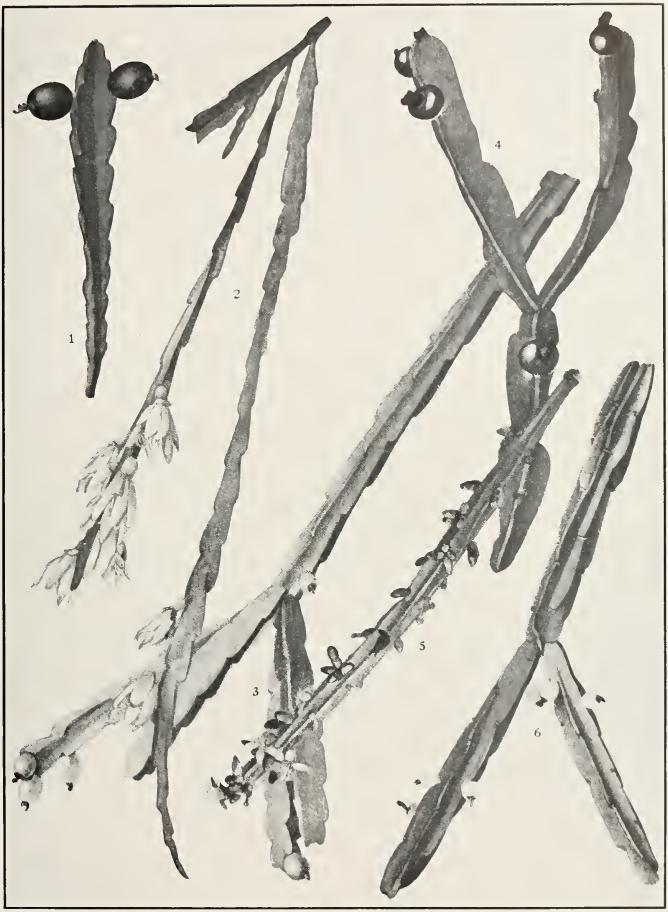
Type locality: Near Campinas, Brazil.

Distribution: Brazil.

Dr. Rose saw the Löfgren type in the Botanical Garden at Rio de Janeiro and obtained living and herbarium specimens of the plant. Dr. Shafer also obtained living specimens from Löfgren in 1917.

Unfortunately, Löfgren's name was given to another plant by Gürke and for this reason we have renamed it in honor of Dr. Alberto Löfgren (1854-1918), who long studied this genus and published an excellent monograph of it in 1915.

Illustration: Arch. Jard. Bot. Rio de Janeiro **1:** pl. 2, as *Rhipsalis novaesii.*



1. Fruiting branch of *Rhipsalis gonocarpa.*
2. Flowering branches of *Rhipsalis warmingiana.*
3. Fruiting branch of *Rhipsalis tonduzii.*
4. Fruiting branch of *Rhipsalis trigona.*
5. Flowering branch of *Rhipsalis pentaptera.*
6. Fruiting branch of same.

(All three-fourths size.)

Figure 225*a* shows two branches with a single fruit 1.33 times natural size; figure 225*b* shows a branch twice natural size; figure 225*c* shows one of the bracts which subtend the areoles, 4 times natural size, all drawn from plants obtained by Dr. Shafer from Dr. Löfgren in 1917 and since grown in the New York Botanical Garden.

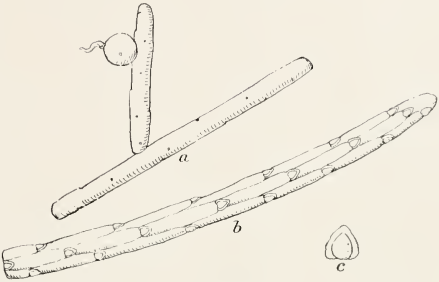


FIG. 225.—Rhipsalis loefgrenii. *a*, fruiting branch; *b*, tip of branch; *c*, bract.

24. **Rhipsalis neves-armondii** Schumann in Martius, Fl. Bras. 4^2: 284. 1890.

?*Rhipsalis rigida* Löfgren, Arch. Jard. Bot. Rio de Janeiro *1:* 93. 1915.

Stems elongated, much branched, and hanging from trees in large clusters; branches arranged in whorls of 3 to 10, 4 to 5 mm. thick, terete, elongated, deep green; flowers widely spreading, 2 cm. broad, white to cream-colored; petals about 12, acute; style erect, white; stigma-lobes 5, white; ovary sunken in the branch; fruit globose, red, 10 mm. in diameter; seeds brown.

Type locality: Mount Tijuca, Rio de Janeiro, Brazil.

Distribution: Rio de Janeiro, Brazil.

There has long been much uncertainly regarding this species and Dr. Rose, during his trip to South America, in 1915, endeavored to solve the problem. He first visited one of the three localities mentioned in the original description, namely Tijuca, a mountain near Rio de Janeiro. Here he found two species which belonged to the same group, *Rhipsalis grandiflora* and *R. pulvinigera*. He then visited the herbarium of the Museo Nacional, where he found specimens of *R. neves-armondii*. Unfortunately, they did not bear an original label but one doubtless written after the appearance of the description in the Flora Brasiliensis for the three localities mentioned therein. After studying this material carefully, he visited the mountain region just above Tijuca, namely Pica Popagaya, where he feels certain he has collected the true form, although the joints are more terete and the flowers are pure white instead of yellow; it is a singular *Rhipsalis* and a very shy bloomer. A second visit was then made to Tijuca, but lower down on the mountain, and here he again found this species.

Illustrations: Martius, Fl. Bras. 4^2: pl. 56; Arch. Jard. Bot. Rio de Janeiro **1:** pl. 19; Blühende Kakteen **2:** pl. 80, A.

Plate XXVIII, figure 1, shows a flowering plant collected by Dr. Rose at the type locality in 1915 (No. 20673), which flowered in the New York Botanical Garden in 1916; Plate XXIV, figures 4 and 5, show branches from the same plant, in fruit.

25. **Rhipsalis pittieri** sp. nov.

Epiphytic, resembling in habit *Rhipsalis cassutha*; branches 5 to 6 mm. in diameter, dull green, terete; petals greenish yellow, 5 to 6 mm. long; ovary sunken in the stem, surrounded by white hairs; fruit maturing very slowly, white; seeds black.

Collected by H. Pittier near Hacienda Koster, Borburata, near Puerto Cabello, Venzuela, in 1913 (No. 6467), and flowered first in Washington in the fall of 1914 (October 16), the fruit maturing March 16, 1915. The plant has repeatedly flowered since. This species is perhaps nearest *Rhipsalis floccosa*, from Brazil, and is the most northern representative of the Series *Floccosae*.

Plate XXIV, figure 6, is of a fruiting specimen of the type plant.

26. Rhipsalis pulvinigera Lindberg, Gartenflora **38:** 186. 1889.

Rhipsalis funalis minor Pfeiffer, Enum. Cact. 135. 1837.

Plant epiphytic, rather stout, at first erect but in time hanging, and then sometimes 3 to 5 meters long, the branches dull green with purple about the areoles, 5 to 7 mm. in diameter; terminal branches often in whorls of 3 to 5; flowers at first white, in age yellowish, 2 cm. broad; ovary sunken in the branch; fruit globose, red, 8 mm. in diameter.

Type locality: Brazil.

Distribution: In the coastal mountains of central Brazil.

Schumann gives *Rhipsalis grandiflora minor* (Gesamtb. Kakteen 644. 1898) as a synonym of this species, but he evidently meant *R. funalis minor*.

Rhipsalis cassytha pilosiuscula Salm-Dyck (Hort. Dyck. 228. 1834), although never described, probably is to be referred here.

Illustrations: Gartenflora **42:** f. 48, as *Rhipsalis funalis;* Gartenflora **38:** f. 33, 34; Rümpler, Sukkulenten 210. f. 119; 211. f. 120; Rev. Hort. **85:** f. 152, in part.

Plate XXVIII, figure 3, is from a plant collected by Dr. Rose near Rio de Janeiro in 1915, which fruited in the New York Botanical Garden in 1915 (No. 43060).

27. Rhipsalis floccosa Salm-Dyck in Pfeiffer, Enum. Cact. 134. 1837.

Hariota floccosa Lemaire, Cact. Gen. Nov. Sp. 75. 1839.
Rhipsalis rugulosa Lemaire, Illustr. Hort. *8:* after pl. 293. 1861.
Hariota rugosa Kuntze, Rev. Gen. Pl. *1:* 263. 1891.

Stems slender, 5 to 8 mm. in diameter, much branched, at first erect, becoming pendent; branches alternate; flowers lateral, 2 cm. broad, white, tinged with yellow, surrounded by a tuft of wool; ovary sunken in the branch; fruit globose, 5 mm. in diameter, rose-colored or nearly white.

Type locality: Not cited.

Distribution: Brazil.

Rhipsalis cassytha major Salm-Dyck (Pfeiffer, Enum. Cact. 134. 1837), a synonym only, is referred here by Pfeiffer.

Hariota floccosa Cels was used as a synonym by Förster (Handb. Cact. 458. 1846), but was not technically published until 1891.

Illustration: Gartenflora **38:** 185. f. 35.

Plate XXIX, figure 1, shows a flowering branch from a specimen sent by Mr. Lamb from Manchester, England, in 1914, and figure 2 shows a flowering branch collected by Dr. Rose in Brazil in 1915 which flowered in the New York Botanical Garden on February 24, 1922.

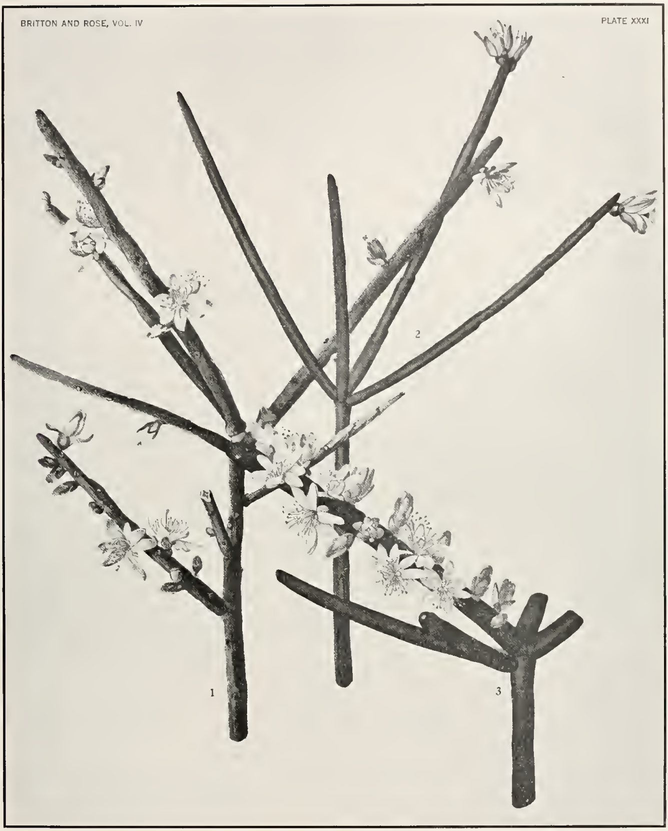
28. Rhipsalis tucumanensis Weber, Rev. Hort. 64: 426. 1892.

Hariota tucumanensis Kuntze, Rev. Gen. Pl. 3^2:107. 1898.

Epiphytic on forest trees, when young setose, but soon naked, much branched; branches often pendent, sometimes in whorls of 4, 4 to 10 mm. in diameter, when young nearly terete, bright green with a red spot at the areoles, when old angled; yellowish green; flowers one from an areole, 15 to 18 mm. in diameter, rosy white to cream-colored; sepals 4, white but rose-colored on the back; petals 8, ovate-lanceolate; stamens numerous, white, spreading, much shorter than petals; style white; stigma-lobes 4 or 5; ovary sunken in the branch, surrounded by a tuft of wool; fruit described as white tinged with red, but often red or pinkish, 8 to 10 mm. broad.

Type locality: Tucuman, Argentina.

Distribution: Tucuman to Catamarca, Argentina, and perhaps Bolivia and Paraguay.



1. Flowering branch of *Rhipsalis grandiflora.*
2. Flowering branch of *Rhipsalis pulchra.*
3. Flowering branch of *Rhipsalis grandiflora.*

(All three-fourths size.)

This species is common in northern Argentina, where it was repeatedly collected by Dr. Shafer in 1917.

Of this relationship, but perhaps specifically distinct, is the plant sent by M. Bang (No. 2323) from Coripati, Yungas, Bolivia, distributed as *Rhipsalis salicornioides*. Here we have tentatively referred K. Fiebrig's plant (No. 5801) from the Upper Paraná, Paraguay.

Of plate XXVIII, figures 4 and 5 show flowering and fruiting branches from Dr. Shafer's collection from Calilegua, Argentina (Nos. 55 and 68), painted at the New York Botanical Garden, May 24, 1922.

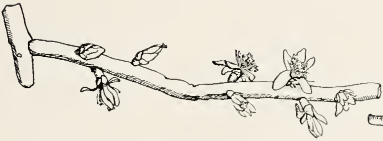


FIG. 226.—Rhipsalis sulcata. Reduced.

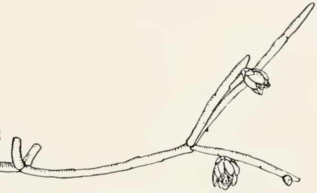


FIG. 227.—Rhipsalis gibberula. x 0.5.

29. Rhipsalis gibberula Weber, Rev. Hort. **64:** 426. 1892.

Stems 3 to 6 mm. thick, yellowish green, with dichotomous or trichotomous branches or sometimes with terminal whorls of 4 or 6; areole small; buds obtuse, pinkish, hairy when in flower; flowers scattered along branches toward tip, white to pale pink, 8 to 9 mm. long, 12 to 15 mm. broad; petals not widely spreading (at least in our specimen); stigma-lobes 3 to 6, white; fruit white, somewhat depressed, 8 to 10 mm. in diameter, 7 to 8 mm. high, the base sunken in the branch.

Type locality: Brazil.

Distribution: Organ Mountains, Brazil.

The species was described from plants brought to Paris from Brazil in 1887, their habitat not recorded, but Dr. Rose traced it to the Organ Mountains in 1915 and his plant flowered in the New York Botanical Garden in February 1921 (No. 21161). In 1902 a specimen was sent from Paris to the New York Botanical Garden and one specimen was obtained from R. Lamb, Superintendent of Parks at Manchester, England, in 1914, but neither has done well in cultivation.

Plate XXIX, figure 4, is from a plant collected by Dr. Rose in the Organ Mountains in 1915, which flowered in the New York Botanical Garden, February 17, 1921. Figure 227 shows the plant received from Paris in 1902 which flowered in the New York Botanical Garden on March 6, 1917.

30. Rhipsalis puniceo-discus G. A. Lindberg, Gartenflora **42:** 233. 1890.

Rhipsalis foveolata Weber, Dict. Hort. Bois 1047. 1898. According to Roland-Gosselin.
Rhipsalis chrysocarpa Löfgren, Arch. Jard. Bot. Rio de Janeiro *1:* 94. 1915.
?*Rhipsalis chrysantha* Löfgren, Arch. Jard. Bot. Rio de Janeiro *1:* 99. 1915.

Branches slender, almost filiform, hanging, pale green when young, freely rooting; branches in terminal whorls, often as many as 6; flowers large, 1.5 cm. long, white; perianth-segments widely spreading; stamens orange-colored, at least at base; fruit at first dark red but in age golden yellow.

Type locality: Not cited.

Distribution: Brazil.

This plant first passed in living collections as *R. funalis gracilis* (Gartenflora **42:** 233. 1893.)

Dr. Löfgren gave Dr. Rose a cutting of the original plant of *Rhipsalis chrysantha.*

Illustrations: Arch. Jard. Bot. Rio de Janeiro **1:** pl. 20, as *Rhipsalis chrysocarpa;* Rev. Hort. **79:** 106. f. 33, as *R. foveolata;* Gartenflora **42:** 235. f. 49; Arch. Jard. Bot. Rio de Janeiro **1:** pl. 21.

Plate XXIX, figure 3, shows a plant also brought by Dr. Rose from Brazil (No. 20662) which flowered and fruited in the New York Botanical Garden, March 7, 1921.

31. Rhipsalis dissimilis (G. A. Lindberg) Schumann in Martius, Fl. Bras. 4^2**:** 286. 1890.

Lepismium dissimile G. A. Lindberg, Gartenflora *39:* 148. 1890.
Rhipsalis dissimilis setulosa Weber, Rev. Hort. *64:*428. 1892.
Rhipsalis pacheco-leonii Löfgren, Arch. Jard. Bot. Rio de Janeiro *2:* 38. 1918

In clumps on large limbs of trees and freely rooting; branches very diverse, some with numerous bristly hairs from the areoles, others naked, erect, prostrate or even hanging; hairy branches with 9 very low ribs, the areoles close together, each with about 15 long white bristles; glabrous branches, 5-angled, with the areoles alternating as in *Rhipsalis paradoxa;* flower-buds red; flowers solitary, about 6 mm. broad; petals few, oblong, obtuse, widely spreading, sometimes turned back, pinkish; stamens erect, numerous, white; ovary sunken in the branch; style pinkish, erect; stigma-lobes 3 or 4, white.

Type locality: Sao Paulo, Brazil.

Distribution: States of Sao Paulo and Rio de Janeiro, Brazil.

We have referred *Rhipsalis pacheco-leonii* here after studying living specimens of *R. dissimilis* and specimens from the type collection obtained by Dr. Rose in 1915 (No. 20707).

Rhipsalis setulosa Weber (Hort. Bois Paris) was published as a synonym of *R. dissimilis* var. *setulosa.*

Illustrations: Gartenflora **39:** 148. f. 36, 37, as *Lepismium dissimile;* Arch. Jard. Bot. Rio de Janeiro **2:** pl. 10, as *Rhipsalis pacheco-leonii;* Curtis's Bot. Mag. **131:** pl. 8013, as *R. dissimilis setulosa;* Blühende Kakteen **2:** pl. 80, B: Gartenflora **40:** f. 121.

Plate XXIX, figures 5 and 6, shows the two diverse forms which this plant takes, as does also plate XXXII, figures 6 and 7. The specimens were collected by Dr. Rose in the state of Rio de Janeiro in 1915 and are a part of the type material of *R. pacheco-leonii.*

32. Rhipsalis pentaptera Pfeiffer in Dietrich, Allg. Gartenz. 4: 105. 1836.

Hariota pentaptera Lemaire, Cact. Gen. Nov. Sp. 75. 1839.

Branches stiff, bright green, 6 to 15 mm. in diameter, strongly 5 or 6-ribbed, the ribs indented at areoles; areoles often 2 cm. apart, small, subtended by broad bracts, usually bearing 2 white bristles; flowers usually scattered along whole length of branches, opening in daytime, 1 to 4 from an areole; scales 4 or 5 at base of corolla, broad and obtuse; petals 5 reddish on back, cream-colored on face, 4 mm. long, obtuse; stamens numerous, about 25, free from petals, white, about as long as style; style and stigma-lobes white; ovary truncate, naked; fruit 3 to 4 mm. in diameter, white, naked, or with an occasional small scale.

Type locality: Not cited. Otto says, in a note, probably Brazil.

Distribution: Southern Brazil and Uruguay.

A very common species in cultivation, flowering freely in March and April.

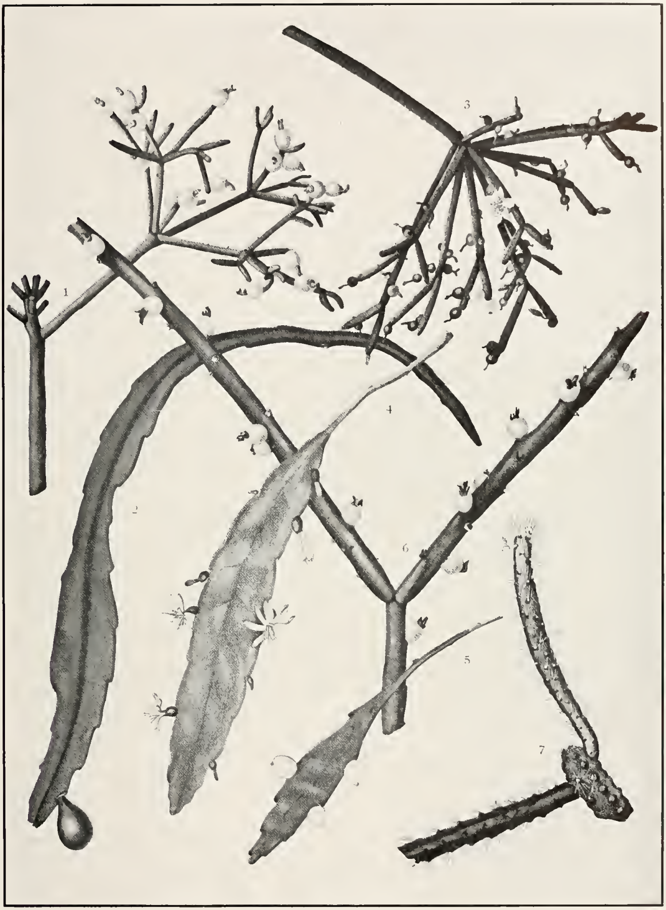
Hariota pentaptera Lemaire and *Rhipsalis pentagona* are given as synonyms of this species by Förster (Handb. Cact. 453. 1846).

Illustrations: Pfeiffer and Otto, Abbild. Beschr. Cact. **1:** pl. 17, f. 1; Goebel, Pflanz. Schild. **1:** pl. 4. f. 4: Gartenwelt **13:** 117; Möllers Deutsche Gärt. Zeit. **25:** 477. f. 11, No. 21; Rev. Hort. **85:** f. 152, in part.

Plate XXX, figures 5 and 6, shows a plant which flowered and fruited in the New York Botanical Garden in 1912 and 1915, obtained from Paris, France, in 1902.

33. Rhipsalis sulcata Weber, Dict. Hort. Bois 1046. 1898.

Stems woody, sometimes 10 to 15 mm. in diameter, often long and pendent; branches elongated, the joints 2 to 3 dm. long, 5-angled, light green; areoles remote (2.5 to 5 cm. apart), usually near the center of a purple blotch; flowers solitary at the areoles, rather large, rotate, white to pinkish; ovary naked.



1. Fruiting branch of *Rhipsalis heteroclada.*
2. Fruiting branch of *Disocactus biformis.*
3. Flowering and fruiting branch of *Rhipsalis prismatica.*
4. Flowering branch of *Rhipsalis coriacea.*
5. Fruiting branch of same.
6. Fruiting branch of *Rhipsalis dissimilis.*
7. Branch of same.

(All three-fourths size.)

Type locality: Not cited.

Distribution: Not known in the wild state.

Weber found this plant in cultivation under the name of *Rhipsalis micrantha*, but it is very different from the true *R. micrantha* which comes from Ecuador.

Figure 226 shows a plant received from Paris in 1902 which flowered in the New York Botanical Garden on March 21, 1912.

34. **Rhipsalis trigona** Pfeiffer, Enum. Cact. 133. 1837.

Hariota trigona Kuntze, Rev. Gen. Pl. *1:* 263. 1891.

Stems stout, very much branched, 1.5 cm. in diameter, strongly 3-angled, the angles or ribs alternating with those of adjoining joints; flowers solitary, white to pinkish, widely spreading, sometimes 2 cm. broad; sepals usually 3, short, obtuse; petals generally 7, oblong, obtuse; filaments numerous, white; style white; stigma-lobes 4, white; ovary sunken in the branch; fruit globose, 8 to 10 cm. in diameter, red.

Type locality: Brazil.

Distribution: Brazil.

Wildeman states that the species is probably from the state of Rio de Janeiro.

Illustrations: Wildeman, Icon. Select. **5:** pl. 193; Arch. Jard. Bot. Rio de Janeiro **1:** pl. 23; Gartenflora **40:** 38. f. 15, 16; Gartenwelt **13:** 117.

Plate XXX, figure 4, shows a plant sent to Dr. Rose by R. Lamb of Manchester, England, in 1914, which flowered and fruited in the New York Botanical Garden in 1919.

35. **Rhipsalis paradoxa** Salm-Dyck, Cact. Hort. Dyck. 1844. 39. 1845.

Lepismium paradoxum Salm-Dyck in Pfeiffer, Enum. Cact. 140. 1837.
Hariota alternata Lemaire, Hort. Univ. *2:* 39. 1841.
Rhipsalis alternata Lemaire, Cactées 80. 1868.
Hariota paradoxa Kuntze, Rev. Gen. Pl. *1:* 263. 1891.

Plants freely giving off aërial roots, branched, hanging in large clusters 1 meter long or more; branches in zigzag links, terminal, in pairs or in whorls of 3 to 8, more or less spreading, 3-winged, pale; flowering areoles very woolly, setose when young, borne at upper ends of ribs; flowers subterminal, large, 2 cm. long, white; ovary sunken in stem; fruit not seen.

Type locality: Brazil.

Distribution: Brazil, especially near the city of Sao Paulo, Brazil.

The young growth is glossy green, the areoles subtended by broad round bracts. Seedling plants are very different from the adult plant; they are strongly 4-angled, with each angle bearing closely-set areoles, filled with slender bristles and showing no resemblance to the typical form; gradually as the plants grow older their mature joints take on the normal form. This plant is a prolific bloomer and in the garden of the Museo Paulista it remains in flower for three weeks.

Pfeiffer (Enum. Cact. 140. 1837) gives *Cereus pterocaulis* Hortus as a synonym of *Lepismium paradoxum* while Förster (Handb. Cact. 453. 1846) gives *Rhipsalis pterocaulis* as a synonym of *R. paradoxa.*

Lepismium alternatum Hortus (Loudon, Hort. Brit. Suppl. **3:** 576. 1850) appeared as a questionable synonym of *Lepismium paradoxum.*

Illustrations: Herb. Génér. Amat. II. **2:** pl. 38; Hort. Univ. **2:** pl. 50, as *Hariota alternata;* Engler and Prantl, Pflanzenfam. 3^{6a}: f. 69, A, B; Schumann, Gesamtb, Kakteen 633. f. 98, B; Karsten, Deutsche Fl. 887. f. 501, No. 4; ed. 2. **2:** 456. f. 605, No. 4; Martius, Fl. Bras. 4^2: pl. 55, f. 1; Arch. Jard. Bot. Rio de Janeiro **1:** pl. 22; Goebel, Pflanz. Schild. **1:** pl. 1, f. 5; Rev. Hort. **85:** f. 152, in part; Karsten and Schenck, Vegetationsbilder **1:** pl. 6, f. c.

Plate XXVIII, figure 2, is from a plant received from La Mortola in 1908 which flowered in the New York Botanical Garden in 1916.

36. **Rhipsalis houlletiana** Lemaire, Illustr. Hort. **5:** Misc. 64. 1858.

Rhipsalis houlletii Lemaire in Curtis's Bot. Mag. *100:* pl. 6089. 1874.
Rhipsalis regnellii Lindberg, Gartenflora *39:* 119. 1889.
Hariota houlletiana Kuntze, Rev. Gen. Pl. *1:* 263. 1891.

Stems 1 to 2 meters long, slender, terete below but flat and broad above; branches flat and thin, 1 to 5 cm. broad, tapering into a petiole-like base; margin serrate; flowers numerous, bell-shaped with a red eye; petals cream-colored, turning pale yellow, lanceolate, acute; stamens numerous; ovary not sunken in the branch, strongly 4 to 5-angled; fruit not angled, globose, red, 5 to 6 mm. in diameter.

Type locality: Not cited.

Distribution: Brazil, in the states of Minas Geraes, Rio de Janeiro, and Sao Paulo.

This species grows on trees in the mountains at an altitude of 1,000 meters.

Rhipsalis regnelliana appears in the general index for the Monatsschrift für Kakteenkunde (volumes 1-20) in place of *R. regnellii.*

Illustrations: Blühende Kakteen **1:** pl. 56; Engler and Prantl, Pflanzenfam. 3^{6a}**:** f. 69, C; Gartenflora **39:** f. 29, 31 to 33; Schumann, Gesamtb. Kakteen f. 98, E; Martius, Fl. Bras. 4^2**:** pl. 58; Möllers Deutsche Gärt. Zeit. **25:** 477. f. 11, No. 14, as *Rhipsalis regnellii:* Curtis's Bot. Mag. **100:** pl. 6089; Gartenflora **39:** f. 30; Rümpler, Sukkulenten 212. f. 121, as *R. houlletii;* Rev. Hort. Belge **40:** after 186, as *R. kegnelli* (in error for *R. regnellii*); Blühende Kakteen **2:** pl. 111; Arch. Jard. Bot. Rio de Janeiro **1:** pl. 17.

Plate XXXIII, figure 1, shows a flowering plant collected by Dr. Rose in Rio de Janeiro, Brazil, in 1915 (No. 20307), which flowered in the New York Botanical Garden in 1918; figure 2 shows a plant obtained from M. Simon of St. Ouen, Paris, in 1901, as *Rhipsalis regnellii,* which flowered in the New York Botanical Garden December 16, 1916; figure 3 shows a dissected flower and figure 4 a fruiting branch; plate XXXIV, figure 1, shows a plant with flowers obtained in Paris in 1901; figure 2 shows a flower cut through the center.

37. **Rhipsalis warmingiana** Schumann in Martius, Fl. Bras. 4^2**:** 291. 1890.

At first erect, then spreading or hanging; branches elongated, jointed, 10 mm. wide or less, either flat or sharply 3 or 4-angled, more or less blotched or colored throughout with purple or red; flowers one at an areole, 20 mm. long, white, directed forward, the perianth-segments spreading, acute; stamens 25 to 30, white; ovary strongly angled; fruit globose, 5 to 6 mm. in diameter, dark purple to nearly black, capped by the withered flower.

Type locality: Near Lagoa Santa, Minas Geraes; two localities were cited when first described, this being the first.

Distribution: State of Minas Geraes, Brazil.

The plant has long been in cultivation, where it does well and blooms freely. Dr. Rose brought back a fresh supply from Brazil in 1915. According to Robert Lamb, the flowers have a perfume resembling that of a hyacinth.

Illustrations: Monatsschr. Kakteenk. **9:** 151; Arch. Jard. Bot. Rio de Janeiro **1:** pl. 18; Gartenflora **41:** f. 5, 6, 7.

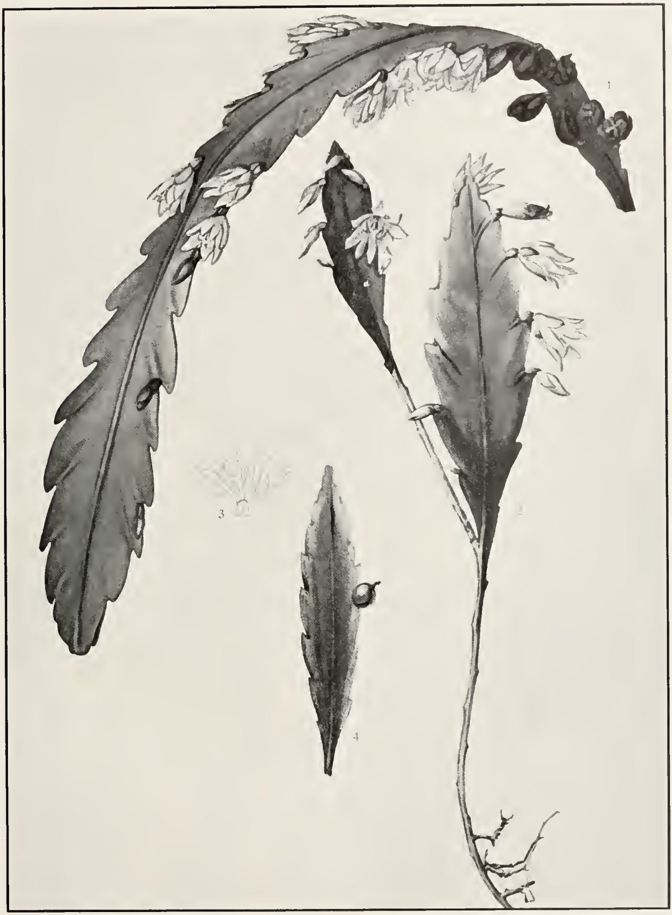
Plate XXX, figure 2, shows a plant from M. Simon which flowered in the New York Botanical Garden in 1912; plate XXXIV, figures 3 and 4, shows two fruiting branches received from the Berlin Botanical Garden in 1902.

38. **Rhipsalis gonocarpa** Weber, Rev. Hort. **64:** 427. 1892.

Very much branched; joints narrowly lanceolate to linear, crenate, 3-angled or flattened, becoming purplish; flowers lateral, white, 15 mm. long; petals 7 or 8, lanceolate; stamens 20 to 30, white; ovary strongly 3-angled; stigma-lobes 3 or 4; fruit terete, dark purple to black, globular to short-oblong, 10 to 12 mm. long.

Type locality: Sao Paulo, Brazil

Distribution: State of Sao Paulo, Brazil.



1. Flowering branch of *Rhipsalis houlletiana*.
2. Flowering branch of same.
3. Flower of same.
4. Fruiting branch of same.

(All three-fourths size.)

Schumann (Gesamtb. Kakteen 641. 1898) refers here as a synonym *Rhipsalis pterocarpa* Weber, a name which he had previously listed in the Flora Brasiliensis (4^2: 300. 1890).

Plate XXX, figure 1, is from a plant sent to Dr. Rose in 1914 by R. Lamb of Manchester, England, which flowered in the New York Botanical Garden in 1920.

39. **Rhipsalis linearis** Schumann in Martius, Fl. Bras. 4^2: 296. 1890.

Stems at first erect but afterwards spreading or prostrate, 6 to 8 dm. long, much branched; branches very narrow, serrate, narrowed at base and woody; flowers white, 16 to 18 mm. long; fruit white, 5 mm. in diameter.

Type locality: Southern Brazil, but no definite locality cited. Localities in Paraguay and Argentina also cited in the original place of publication.

Distribution: Southern Brazil, Uruguay, Paraguay, and northern Argentina.

We know this species only from description.

40. **Rhipsalis micrantha** (HBK.) De Candolle, Prodr. 3: 476. 1828.

Cactus micranthus Humboldt, Bonpland, and Kunth, Nov. Gen. et Sp. *6:* 65. 1823.
Hariota micrantha Kuntze, Rev. Gen. Pl. *1:* 263. 1891.

Either epiphytic and pendulous or clambering over rocks; branches 3 or 4-angled or flattened, 5 to 8 mm. broad; areoles small, remote, bearing often 1 to 4 bristles; flowers white, lateral, 7 mm. long including the ovary; petals cream-colored, spreading, obtuse; filaments, style, and stigma-lobes white; fruit 8 to 10 mm. long, naked, white to reddish, globose; seeds black.

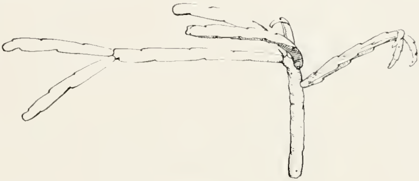


FIG. 228.—Rhipsalis micrantha. x 0.5.

Type locality: Near Olleros, formerly in Ecuador, now in northern Peru.

Distribution: Ecuador and northern Peru.

Schumann describes this species as having 5 angles and cites only Humboldt's plant. The original description says 3 or 4-angled or compressed. The plant which he actually described is doubtless *Rhipsalis sulcata,* which has long passed in collections as *R. micrantha.*

Dr. Rose found this species quite common in southern Ecuador and brought back living specimens of it. The specimen in the New York Botanical Garden which came from Berlin agrees with Schumann's description.

Figure 228 shows a branch from the plant brought by Dr. Rose from southern Ecuador in 1918 (No. 23248).

41. **Rhipsalis tonduzii** Weber, Dict. Hort. Bois 1046. 1898.

Stems giving off aërial roots freely, at first erect but branches hanging, 1 cm. in diameter or less, normally 4 or 5-angled, sometimes 7-angled, but terminal branches often 3-angled or occasionally flattened and 2-angled; branches about 10 cm. long, usually terminal but always in clusters of 2 to 6, pale green; areoles close together, forming notches in the branch; flowers small, 12 mm. long, white; ovary exserted (Schumann says immersed); fruit globose, short-oblong, white, 7 to 10 mm. long, usually on upper half of terminal branches, resembling fruit of *Rhipsalis cassutha* but much longer, sometimes abortive and covered with hairs, thus resembling a small chestnut-bur, perhaps the result of insect stings; seeds oblong, numerous, black.

Type locality: Costa Rica.

Distribution: Costa Rica but range unknown.

This species flowered in Washington in March 1912, in June 1919, and again in April 1920; fruit was obtained July 31, 1919, and in April 1920.

Plate xxx, figure 3, shows a branch of a plant brought back from Costa Rica by Dr. Maxon in 1906.

Of this relationship is the following:

RHIPSALIS WERCKLEI Berger, Monatsschr. Kakteenk. 16: 64. 1906.

Epiphytic, much branched, hanging, 3 to 6 dm. long; branches 2 to 4-angled, mostly 3, 8 to 10 cm. long, 10 mm. broad or less, without aërial roots; flowers borne singly along the whole branch, small; sepals 2; petals 4, creamy white; ovary not sunken in the branch; fruit globose, naked or with an occasional small scale, white, 5 mm. long; seeds numerous, brownish.

Type locality: Navarro, Costa Rica.

Distribution: Costa Rica.

The above description with regard to flowers and fruit has been copied. Our living specimens suggest that it may be different from *Rhipsalis tonduzii*, but whether specifically distinct will require further study to determine.

42. **Rhipsalis boliviana** (Britton) Lauterbach in Buchtien, Contr. Fl. Bolivia **1:** 145. 1910.

Hariota boliviana Britton in Rusby, Mem. Torr. Club 3^3: 40. 1893.

Stems somewhat 4-angled and narrowly winged at base, setose at the areoles, the setae 5 to 10, yellowish white, about 2 mm. long; branches 1.5 to 30 cm. long, flattened and thin, 1 to 2 cm. broad, broadly crenate, the crenations 1.5 to 3 cm. long; flowers usually solitary but sometimes 2 or 3 at an areole, about 15 mm. long, one-half to two-thirds as broad, "yellow"; fruit globose, nearly 1 cm. in diameter, truncate at apex.

Type locality: Yungas, Bolivia.

Distribution: Wet forests of Bolivia.

43. **Rhipsalis lorentziana** Grisebach, Abh. Ges. Wiss. Göttingen **24:** 139. 1879.

Epiphytic on forest trees or clambering over rocks, freely rooting along stems; lower part of stem often terete; branches thin, flattened or sometimes 3-angled, usually elongated and narrow, sometimes more or less constricted near middle, 3 cm. broad or less, coarsely serrate, usually cuneate at base; flowers white, about 4 cm. long; ovary oblong, strongly angled, naked except a few scales at the top; fruit globose, purplish, 3 mm. in diameter.

Type locality: Oran, Argentina.

Distribution: Northwestern Argentina and to be expected in southern Bolivia.

Dr. Kurtz gave to Dr. Rose when he was in Córdoba, Argentina, in 1915, a part of the plant collected by Lorentz and Hieronymus in 1893 (No. 454), which proves to be the type.

44. **Rhipsalis ramulosa** (Salm-Dyck) Pfeiffer, Enum. Cact. 130. 1837.

Cereus ramulosus Salm-Dyck, Hort. Dyck. 340. 1834.
Hariota ramulosa Lemaire, Cact. Gen. Nov. Sp. 75. 1839.*

Stems woody, 3 dm. or more high, erect, terete; branches 7 to 12 cm. long, 1.2 to 2.5 cm. broad, pale green, with distant low crenations 12 to 20 mm. apart, when young often ciliate at areoles but in age naked; flowers solitary at the areoles, small, rotate, greenish white; sepals and petals 6 or 7, ovate-lanceolate, adhering to the base of the ovary, persistent; stamens 12 to 18; style filiform; stigma lobes inconspicuous; fruit glabrous, 5 to 6 mm. in diameter, white and subpellucid with 2 to 3 minute scales; seeds small, black.

Type locality: Not cited.

Distribution: Western Brazil and in the adjacent borders of Bolivia and Peru (according to Vaupel).

Collected by R. S. Williams at Isapuri, Bolivia, altitude 1,550 feet, October 1, 1901 (No. 734). We have also referred here H. H. Rusby's No. 749 from trunk of trees near the cataracts of Bopi River, Bolivia, altitude 2,500 feet, September 8, 1921.

We know this plant from herbarium specimens; it is similar to *Rhipsalis lorentziana* but bearing scales on the ovary.

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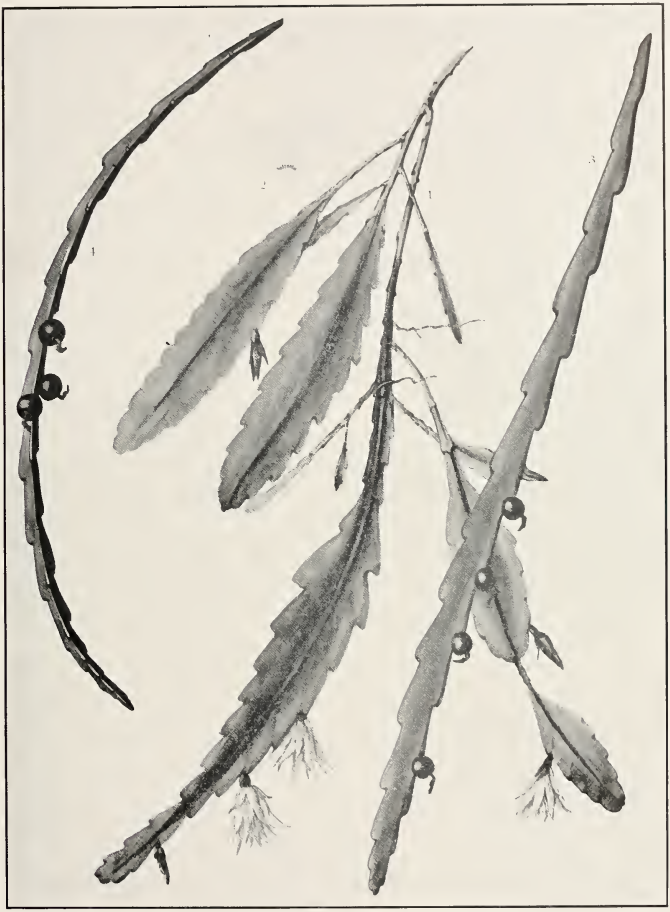
* Lemaire, in 1839 (Cact. Gen. Nov. Sp. 74, 75), combines *Rhipsalis* with *Hariota*, and 8 of the 10 species which he lists had not heretofore been referred to *Hariota*. They are, therefore, to be credited to Lemaire rather than to Otto Kuntze (Rev. Gen. Pl. *1:* 262. 1891), as has been done in the Index Kewensis.



1. Flowering branch of *Rhipsalis houlletiana*.
2. Flower of same.
3. Fruiting branch of *Rhipsalis warmingiana*.
4. Fruiting branch of same.

(All three-fourths size.)

Rhipsalis ramulosa has long been a doubtful species. Its origin was unknown at the time of its first publication, but Schumann in 1890 attributed it to Costa Rica, but this was evidently a mistake.

Vaupel has recently published an article (Zeitschrift für Sukkulentenkunde **1**: 19. 1923) in which he states that the type was cultivated in the Botanical Garden of Berlin in 1833 and that specimens are now preserved in the herbarium there. He states that these are the same as the plant collected by Ule at Seringal, San Francisco, in the Upper Acre region of Brazil, about 10° south latitude, towards the border of Bolivia and Peru. He would also refer here a plant collected by Tafalla in 1790 at Pozugo in eastern Peru. *Cactus dentatus* Ruiz (Martius, Fl. Bras. 4^2: 288. 1890), given as a synonym of *Rhipsalis alata* by Schumann, is based on Tafalla's plant and according to Vaupel should not have been credited to Ruiz.

Epiphyllum ramulosum, E. ciliare, and *E. ciliatum* were all given by Pfeiffer (Enum. Cact. 130. 1837) as synonyms of *Rhipsalis ramulosa.*

Figure 229 shows a drawing made from Mr. Williams's specimen.

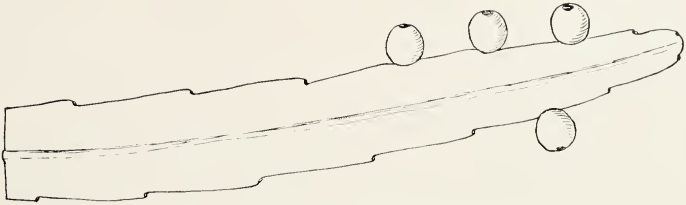


FIG. 229.—Top of fruiting branch of Rhipsalis ramulosa. x 0.75.

45. **Rhipsalis purpusii** Weingart, Monatsschr. Kakteenk. **28**: 78. 1918.

Plant epiphytic; stems 8 mm. in diameter, woody, terete, brown; branches weak, elongated, terete below, flattened above, thin, remotely crenate; flowers small, white, solitary.

Type locality: Cerro de Boqueron, Chiapas, Mexico.

Distribution: Known only from the type locality.

Illustrations: Monatsschr. Kakteenk. **28**: 79; Möllers Deutsche Gärt. Zeit. **35**: 117.

46. **Rhipsalis coriacea** Polakowsky, Linnaea **41**: 562. 1877.

Hariota coriacea Kuntze, Rev. Gen. Pl. *1:* 262. 1891.
Rhipsalis angustissima Weber Bull. Mus. Hist. Nat Paris *8:* 465. 1902.
Rhipsalis leiophloea Vaupel, Zeitschrift Sukkulentk. *1:* 20. 1923.

Stems 2 to 10 cm. high, woody and terete at base, with many lateral branches; branches often hanging, 1 to 3.5 cm. broad, thin, serrate, the teeth 1.5 to 2.5 cm. apart, bearing the small areoles; young branches purple, terete at first, but finally broad and flattened above; areoles at base of branch and sometimes but rarely on flattened part, bearing 2 to 7 long, hairy bristles; flowers rather narrow, including ovary 12 mm. long, each subtended by a shallow scale; sepals and petals erect below; sepals usually 3, cream-colored, tinged with red; petals greenish white to pinkish, usually 5 to 10, obtuse, 7 to 8 mm. long; stamens numerous, white; style white; stigma-lobes short, white; fruit white, 7 mm. in diameter, bearing several broad, rounded scales; seeds black.

Type locality: Near Cartego, Costa Rica.

Distribution: Widely distributed in Costa Rica.

This species flowers in March.

Rhipsalis coriacea, which originally came from Costa Rica, Schumann referred to *R. alata* of Jamaica, a plant of similar habit but yet very distinct.

Illustration: Bull. Mus. Hist. Nat. Paris **8:** 466, as *Rhipsalis angustissima.*

Plate XXXII, figure 4 shows a flowering specimen and figure 5 a fruiting specimen from a plant collected by Wm. R. Maxon at Tunialba, Costa Rica, in April 1900, painted at the New York Botanical Garden on April 12, 1912.

47. **Rhipsalis jamaicensis** Britton and Harris, Torreya **9:** 159. 1909.

Pendent from trees, 3 to 10 dm. long, the main axis angular; joints 1 to 4 dm. long, 1 to 2.5 cm. broad, thin, dull green, bluntish at apex, narrowed into a short or elongated stipe at base, the margins low-crenate; flowers yellowish green, about 6 mm. long; perianth-segments about 7, oblong to oblanceolate, only a little spreading, obtusish; ovary oblong, bearing a few small scales; stamens 20 to 30; style longer than stamens; stigma-lobes 3; fruit globose, 6 to 8 mm. in diameter, white, the scales 3 mm. broad.

Type locality: Troy, Cockpit Country, Jamaica.

Distribution: Forests of Jamaica.

Illustration: Torreya **9:** 158. f. 3.

Plate XXII, figure 4, shows a plant with flowers and young fruit from Jamaica.

48. **Rhipsalis platycarpa** (Zuccarini) Pfeiffer, Enum. Cact. 131. 1837.

Epiphyllum platycarpum Zuccarini, Cat. Cact. Monac. 1836.
Cereus platycarpus Zuccarini, Ahb. Bayer, Akad. Wiss. München *2:* 736. 1837.
Hariota platycarpa Kuntze, Rev. Gen. Pl. *1:* 263. 1891.

Branches broad and flat, 1 to 2 dm. long, 3 cm. broad or more, dull green becoming red when grown in sunlight, with broad deep crenations; flowers borne toward apex of branch, 1 to 3 from an areole, 16 to 18 mm. long, greenish yellow or dull white; petals 8 mm. long, ovate; stamens white; stigma-lobes 5, white; fruit (doubtless immature) naked, green, somewhat compressed, angled, truncate.

Type locality: Brazil.

Distribution: Organ Mountains, Brazil.

We have obtained plants of this species from Mr. Lamb at Manchester in 1904 and Dr. Rose found it wild in the Organ Mountains of Brazil in 1915 (No. 21159). It grows well in cultivation but it has never flowered with us.

Illustrations: Pfeiffer and Otto, Abbild. Beschr. Cact. **1:** pl. 17, f. 2; Blühende Kakteen **2:** pl. 90.

Figure 230 shows a branch of the plant obtained by Dr. Rose in the Organ Mountains.

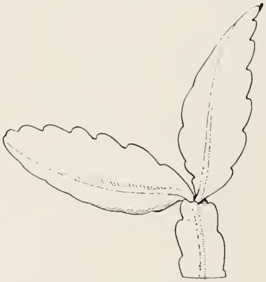
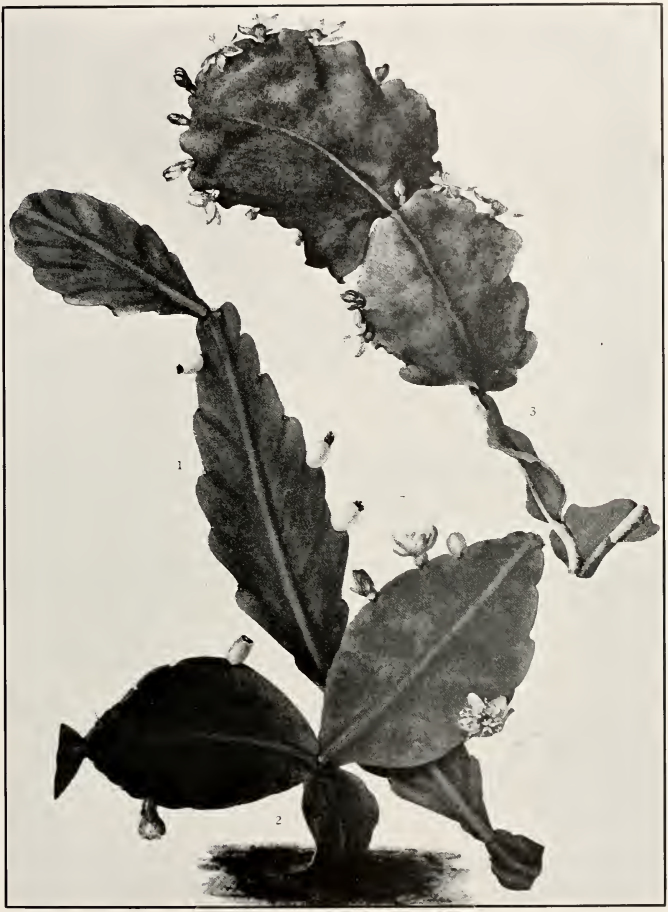


FIG. 230.—Rhipsalis platycarpa. x 0.4.

49. **Rhipsalis russellii** sp. nov.

Hanging in great clusters from the horizontal branches of trees; branches strongly flattened, 15 cm. long, 5 to 6 cm. broad, cuneate at base, strongly crenate, dark green or purplish along margins; flowers often 9 at an areole, minute; sepals few, obtuse, reddish at tips; petals usually 5, cream-colored, obtuse, 2 mm. long; fruit usually 1 at an areole, small, globose, 5 to 6 mm. in diameter, purple.

Collected by J. N. Rose and Paul G. Russell near Toca da Onca, Bahia, Brazil, June 27 to 29, 1915 (No. 20106). This species suggests *Rhipsalis elliptica,* but has very different flowers and fruit.



1. Fruiting branch of *Rhipsalis oblonga.*
2. Fruiting branch of *Rhipsalis elliptica.*
3. Flowering branch of *Rhipsalis crispata.*

(All three-fourths size.)

Of plate XXXVII, figures 1 to 4 are from the type specimen which has repeatedly flowered and fruited in the New York Botanical Garden; figure 1 shows the tip of a flowering branch; figure 2 shows a cluster of six flowers; figure 3 shows a flower enlarged four diameters; figure 4 shows a fruiting branch.

50. Rhipsalis elliptica Lindberg in Martius, Fl. Bras 4^2: 293. 1890.

Rhipsalis chloroptera Weber, Dict. Hort. Bois 1045. 1898.
Rhipsalis elliptica helicoidea Löfgren, Arch. Jard. Bot. Rio de Janeiro *2:* 44. 1918.

Plants growing in clumps, at first ascending, often hanging from trees; joints flat and broad, oblong to elliptic, 3 to 20 cm. long, 2 to 7 cm. broad, the margin faintly to strongly crenate; flowers generally 1, sometimes 2 or 3 at an areole, 12 mm. broad; petals usually 5, yellowish, widely spreading, oblong, obtuse; filaments numerous, nearly erect, white; style white; stigma-lobes white, 5; ovary not sunken in the branch; fruit reddish, a little longer than broad, 6 to 7 mm. long.

Type locality: Near Sorocaba, south of Santos, Sao Paulo, Brazil.

Distribution: States of Sao Paulo and Santa Catharina, Brazil.

Illustrations: Arch. Jard. Bot. Rio de Janeiro **2**: pl. 16, as *Rhipsalis elliptica helicoidea:* Blühende Kakteen **2**: pl. 104, as *Rhipsalis chloroptera:* Arch. Jard. Bot. Rio de Janeiro **1**: pl. 15.

Plate XXXV, figure 2, is from a plant collected by Dr. Rose at Jabaquara, near Rio de Janeiro, Brazil, in 1915, which flowered in the New York Botanical Garden in 1916.

51. Rhipsalis pachyptera Pfeiffer, Enum. Cact. 132. 1837.

Cactus alatus Willdenow, Enum. Pl. Suppl. 35. 1813. Not Swartz, 1788.
Epiphyllum alatum Haworth, Suppl. Pl. Succ. 84. 1819.
Cactus triqueter Vellozo, Fl. Flum. 206. 1825. Not Willdenow, 1813. Not Haworth, 1803.
Cereus alatus Link and Otto, Icon. Pl. Rar. 77. 1830.
Lepismium fluminense Miquel, Bull. Neerl. 48. 1838.
Rhipsalis robusta Lemaire, Rev. Hort. IV. *9:* 502. 1860.
Rhipsalis pachyptera purpurea Corderoy, Gard. Chron. III. *2:* 468. 1887.
Hariota triquetra Kuntze, Rev. Gen. Pl. *1:* 263. 1891.
Hariota pachyptera Kuntze, Rev. Gen. Pl. *1:* 263. 1891.
Hariota robusta Kuntze, Rev. Gen. Pl. *1:* 263. 1891.
Rhipsalis crassa Schumann, Keys 54. 1903.

Stems much jointed, pendent; joints often 3 to 6 dm. long, 5 to 7 cm. broad, thickish, stiff, sometimes nearly orbicular, often purple, deeply crenate; flowers numerous, but solitary, rarely 2 to 4 from the areole, large; petals widely spreading, yellowish; stamens numerous; stigma-lobes 4 or 5, slender; fruit globose, white.

Type locality: Originally given as the West Indies,* but this is doubtless a mistake.

Distribution: States of Rio de Janeiro, Minas-Geraes, Santa Catherina, and Sao Paulo, Brazil.

The species grows in the high mountains on trunks of trees, altitude 1,000 meters, down to nearly sea-level.

A variety, *crassior* Salm-Dyck (Pfeiffer, Enum. Cact. 132. 1837) ,with thick green orbicular joints, has been described.

Steudel's name of *Rhipsalis alata* (Nom. ed. 2. **1**: 333. 1840), given as a synonym of *Cereus alatus* De Candolle, is referred here by Schumann, but probably relates to *Pseudorhipsalis.*

This species was for a long time confused with *Rhipsalis alata,* a very distinct species from Jamiaca, now referred by us to the genus *Pseudorhipsalis.*

Illustrations: Curtis's Bot. Mag. **55**: pl. 2820,* as *Cactus alatus;* Vellozo, Fl. Flum. **5**: pl. 25, as *Cactus triqueter;* pl. 33, as to flower only; Link and Otto, Icon. Pl. Rar. pl. 39, as *Cereus alatus;* Monatsschr. Kakteenk. **6**: 55; **7**: 151, in part, as *Rhipsalis robusta;* Blühende Kakteen

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* The plant, however, which Hooker described and figured (Curtis's Bot. Mag. *55:* pl. 2820) as *Cactus alatus* and which Pfeiffer cited in his original description, came from the Organ Mountains near Rio de Janeiro, Brazil.

1: pl. 34; Martius, Fl. Bras. 4^2: pl. 57; Paxton's Fl. Gard. **1**: pl. 99; Arch. Jard. Bot. Rio de Janeiro 1 pl. 14; Möllers Deutsche Gärt. Zeit. **25**: 477. f. 11, No. 15; Gartenwelt **13**: **117**; **16**: 633, 635; Karsten and Schenck, Vegetationsbilder **1**: pl. 5, f. d.

Plate XXXVII, figure 6, shows a fruiting branch from the plant obtained by Dr. Rose in Brazil in 1915 (No. 20346); plate XXXVI, figure 1, shows a flowering branch from a plant obtained from M. Simon, of Paris, in 1901.

52. Rhipsalis rhombea (Salm-Dyck) Pfeiffer, Enum. Cact. 130. 1837.

Cereus rhombeus Salm-Dyck, Hort. Dyck. 341. 1834.
Hariota rhombea Lemaire, Cact. Gen. Nov. Sp. 75. 1839.

Stems terete or angled; branches usually flat and thin, but sometimes 3-angled; joints oblong, 1 to 3 cm. broad, cuneate at base, strongly crenate, dark green or purple; flowers usually solitary at areoles but sometimes in 2's, small, cream-colored, with a red spot at base of stamens; sepals reddish; petals obtuse; fruit dark red.

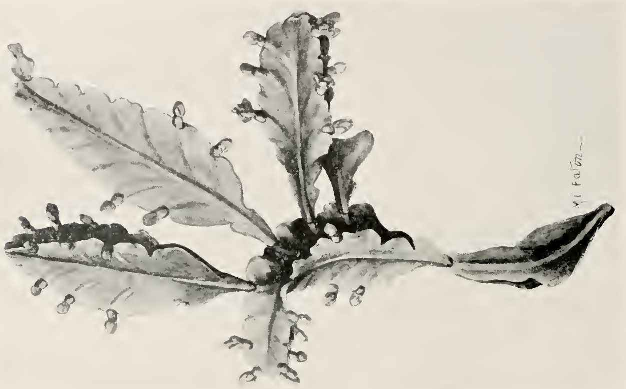

Fig. 231.—Rhipsalis crispimarginata.

Type locality: Not cited.

Distribution: Brazil, but range unknown.

Cereus crispatus crenulatus, Epiphyllum crenulatum, and *E. rhombeum* were referred by Pfeiffer (Enum. Cact. 130. 1837) as synonyms of this species.

Here perhaps also belongs *Cereus crispatus latior* (Salm-Dyck, Hort. Dyck. 66. 1834), which is without description.

Illustrations: Gartenwelt **16**: 635; Karsten and Schenck, Vegetationsbilder **1**: pl. 6, f. e; Möllers Deutsche Gart. Zeit. **25**: 477. f. 11, No. 13; Wildeman, Icon. Select. **2**: pl. 67; Arch. Jard. Bot. Rio de Janeiro **1**: pl. 16.

Plate XXXVI, figure 2, shows a flowering plant received from the Royal Botanical Garden at Kew in 1902 which flowered in the New York Botanical Garden in January 1912.

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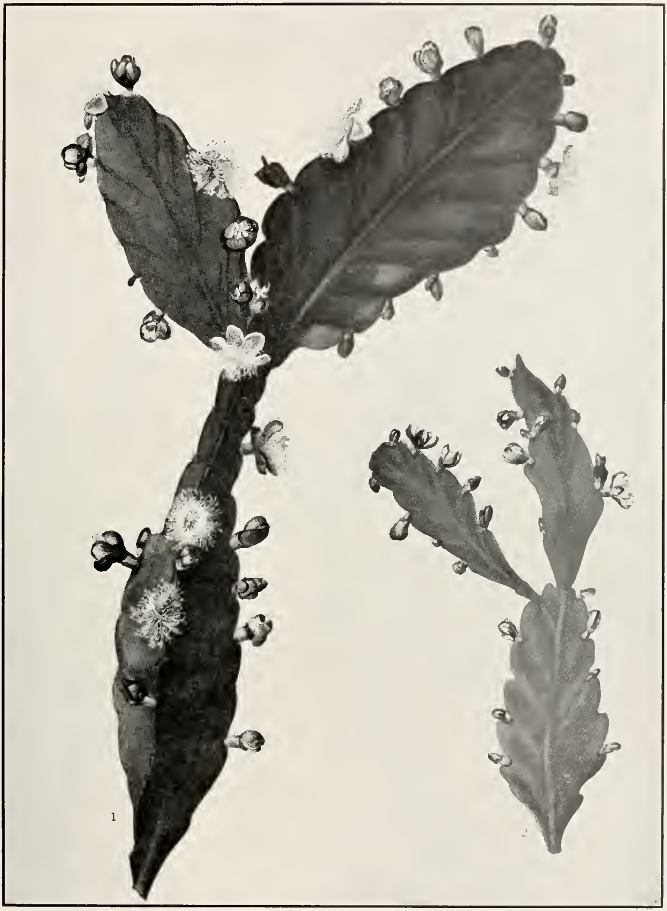
* According to the Index Kewensis this is *Cactus speciosus* Hooker, said to be equal to *Rhipsalis swartziana.*



1. Flowering branch of *Rhipsalis pachyptera.*
2. Flowering branch of *Rhipsalis rhombea.*
(All three-fourths size.)

53. Rhipsalis crispimarginata Löfgren, Arch. Jard. Bot. Rio de Janeiro **2:** 37. 1918.

Plants pendulous, the main stem terete below, often 3-winged above; terminal branches in clusters, oblong, flat, obtuse, narrowed at base, shining green or tinged with purple, 4 to 6 cm. long; flowers usually solitary but sometimes 2 or 3 at an areole, white, drying pale yellow; sepals ovate-obtuse, reflexed; petals white, widely spreading, numerous; stigma-lobes white; fruit globose, white.

Type locality: Ilha Grande, near the city of Rio de Janeiro.

Distribution: State of Rio de Janeiro, Brazil.

Illustration: Arch. Jard. Bot. Rio de Janeiro **2:** pl. 9.

Plate XXXVII, figure 5, shows a fruiting branch of the type collection obtained by Dr. Rose on Ilha Grande near Rio de Janeiro in 1915 (No. 20401). Figure 231 is from a photograph of Miss Eaton's painting of a plant given to Dr. Shafer by Dr. Löfgren in 1917 at Rio de Janeiro which flowered in the New York Botanical Garden in May 1922.

54. Rhipsalis crispata (Haworth) Pfeiffer, Enum. Cact. 130. 1837.

Epiphyllum crispatum Haworth, Phil. Mag. *7:* 111. 1830.
Rhipsalis crispata latior Salm-Dyck in Pfeiffer, Enum. Cact. 130. 1837.
Hariota crispata Lemaire, Cact. Gen. Nov. Sp. 75. 1839.
Rhipsalis rhombea crispata Schumann, Gesamtb. Kakteen 638. 1898.

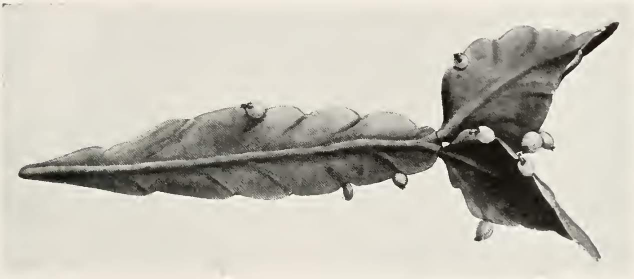


FIG. 232.—Rhipsalis crispata.

Branches divided into short flat joints 6 to 10 cm. long, broad both at base and apex, green, more or less crenate; flowers solitary or sometimes 2 to 4 at an areole, 10 to 12 mm. broad, cream-colored to light yellow; filaments numerous; fruit white, 7 mm. in diameter.

Type locality: Brazil.

Distribution: Brazil, but range unknown.

The synonyms *R. crispa* and its var. *major* (Förster, Handb. Cact. 450. 1846) and *R. crispa latior* Salm-Dyck (Walpers, Repert. Bot. **2:** 279. 1843); *Hariota crispata latior* Lemaire (Cact. Gen. Nov. Sp. 75. 1839) doubtless belong here. Schumann, in Nachtrag, page 144, refers here *Rhipsalis swartziana* Pfeiffer.

Pfeiffer publishes as a synonym of the above *Cereus crispatus* (Enum. Cact. 130. 1837), as does also Förster. Schumann (Gesamtb. Kakteen 638. 1898) makes this species a variety of *Rhipsalis rhombea,* but later (Gesamtb. Kakteen Nachtr. 145. 1903) recognizes two species.

Cactus torquatus (Walpers, Repert. Bot. **2:** 342. 1843), referred to *Rhipsalis rhombea* by Walpers, was only a garden name.

Illustrations: Arch. Jard. Bot. Rio de Janeiro **1:** pl. 16, as *R. rhombea:* Gartenwelt **13:** 117; Garten-Zeitung **1:** 459. f. 109; Rev. Hort. **85:** f. 152, in part.

Plate XXXV, figure 3, shows a flowering plant received from A. Berger in 1908. Figure 232 is from a photograph of Miss Eaton's painting of the plant obtained by Dr. Rose in Brazil in 1915 (No. 20708) which flowered and fruited in the New York Botanical Garden in 1922.

55. Rhipsalis oblonga Löfgren, Arch. Jard. Bot. Rio de Janeiro **2**: 36. 1918.

In cultivation bushy; main branches terete below, more or less flattened above; ultimate branches narrowly oblong, 5 to 15 cm. long, 1 to 2 cm. broad, shining green even in sunlight; flowers borne along the sides of the branches, solitary at the areoles; fruit globular to short-oblong, 3 to 4 mm. long, nearly white, naked, crowned by the withered perianth.

Type locality: On Ilha Grande, Brazil.

Distribution: Known only from the type locality.

Illustration: Arch. Jard. Bot. Rio de Janeiro **2**: pl. 8, as *Rhipsalis oblonga.*

Plate XXXV, figure 1, shows the plant grown by Dr. Löfgren at Rio de Janeiro and given to Dr. Shafer in 1917, which flowered and fruited in the New York Botanical Garden in May 1922.

56. Rhipsalis cuneata sp. nov.

Epiphytic on trees; joints oblong to spatulate, 8 to 12 cm. long, thin, obtuse, cuneate at base, strongly crenate, naked at the areoles or with a bristle or two; flowers so far as known solitary; fruit globose, 4 mm. in diameter, naked.

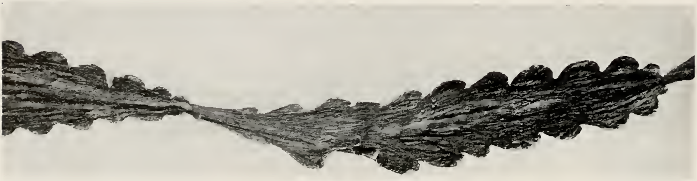


FIG. 233.—Rhipsalis cuneata.

Collected by R. S. Williams above San Juan, Bolivia, altitude 5,500 feet, April 2, 1902 (No. 2458). This species is known to us only from herbarium specimens.

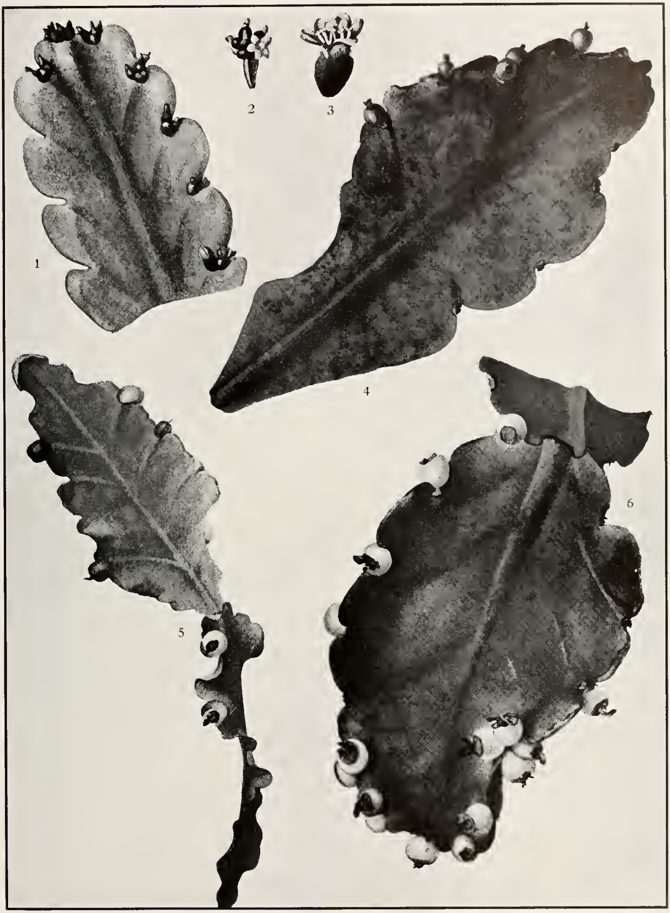
Figure 233 is from a photograph of the specimen in the U. S. National Herbarium.

57. Rhipsalis roseana Berger, Zeitschrift für Sukkulentenkunde **1**: 22. 1923.

Lower joints flat, 15 to 20 mm. broad, distinctly alternately notched; areoles small, with a little tuft of white wool and a single short brown hair, 15 to 20 mm. apart, the upper ones more closely set; upper joints narrower and more linear or linear-lanceolate, 10 to 15 mm. broad and 6 to 12 cm. long or more, equally notched, smooth, bright green; some of the uppermost joints often narrower, 8 to 10 mm. broad and only shallowly notched, others triangular with prominent notched angles and excavated sides, others 1 cm. wide, with 3 or 4 prominently wing-like distinctly but remotely notched ribs and areoles about 4 cm. apart; flowers small, whitish yellow.

This species was described from cultivated plants of unknown origin. We believe that it may be from Colombia and we would refer here the following specimens: Wilson Popenoe's No. 518 from near San Miquel, Perdoma, Tolima, 1921, and Ellsworth P. Killip's No. 8203 from mountains west of Popayán, 1922.

Mr. Berger writes: "This new *Rhipsalis* is decidedly distinct from *R. wercklei;* its branches are shorter, broader, more deeply notched and of a firmer nature. Its growth too is far less quick and it does not form so promptly long and pendent shoots as *R. wercklei.*"



1. Flowering branch of *Rhipsalis russellii*.
2. Cluster of flowers of same.
3. Flower of same.
4. Fruiting branch of same.
5. Fruiting branch of *Rhipsalis crispimarginata*.
6. Fruiting branch of *Rhipsalis pachyptera*.

(All three-fourths size.)

UNPUBLISHED OR INCOMPLETELY DESCRIBED SPECIES.

Rhipsalis chrysantha Löfgren, Arch. Jard. Bot. Rio de Janeiro 1: 99. 1915.

We know this species only from description. Löfgren places it in his subgenus *Lepismium* near *Rhipsalis dissimilis,* but his descriptions suggest *R. rosea* (our *Rhipsalidopsis rosea*). Both names are based on Dr. P. Dusen's collections from Paramá, Brazil. It seems near *R. puniceodiscus.*

Rhipsalis frondosa Wercklé, Subregion Fitogeografica Costa Ricense 42. 1909.

The above name is given without description.

Weingart (Monatsschr. Kakteenk. **20:** 185. 1910) refers to this plant as a new species represented in a sending from Costa Rica by Wercklé. Nothing further is known about it.

Rhipsalis riedeliana Regel, Ind. Sem. Hort. Petrop. **1860:** 49. 1860.

Hariota riedeliana Kuntze, Rev. Gen. Pl. *1:* 263. 1891.

This plant was sent from Brazil by Riedel, but we do not know it. Schumann did not know it.

Rhipsalis bucheni Béhagnon (Rev. Hort. **85:** 436. f. 152. 1913) we know only from the illustration of a poor potted plant and an incomplete description.

Rhipsalis carnosa and *R. lagenaria* are names mentioned by Vöchting (Jahrb. Wiss. Bot. Leipzig **9:** 368, 372. 1873).

Rhipsalis erythrolepis Bénagnon (Rev. Hort. **85:** f. 152, part) is known only from a potted plant of some species with broad, flat joints.

Rhipsalis filiformis seems to be only a garden name (Monatsschr. Kakteenk. **6:** 47. 1896). It may be the same as *R. cribrata filiformis* Engelhardt (Möllers Deutsche Gärt. Zeit. **18:** 585. 1903).

Rhipsalis itatiaiae Weber appears in Robert Lamb's Collection of Cacti, page 72, 1908, without description. In 1914 Mr. Lamb sent Dr. Rose a specimen under this name, but it has not bloomed. A part of this plant from Mount Itatiaya, Brazil, is now growing in the New York Botanical Garden (Rose, No. 888).

Rhipsalis macahensis Glaziou (Bull. Soc. Bot. France Mem. III. 326. 1909) is only a name. According to Glaziou he collected it on rocks and trees at Alto Macahé, Rio de Janeiro (No. 18262).

Rhipsalis microcarpa Steudel, is a name found only in Schumann's Index (Gesamtb. Kakteen 832. 1898).

Rhipsalis miquelii Lemaire (Cactées 80. 1868) is not described but it is grouped with *R. pachyptera. R. rhombea,* and other flat-jointed species. Lemaire also lists *R. turpinii* on the same page, associating it with *R. micrantha* and *R. trigona.*

Rhipsalis oligosperma Lindberg (Monatsschr. Kakteenk. **7:** 21. 1897) is a name only.

Rhipsalis spathulata Otto (Sweet, Hort. Brit. ed. 3. 1839) Schumann thought might be a mistake for *Pereskia spathulata.* Kuntze takes it up, however, as *Hariota spathulata* (Rev. Gen. Pl. **1:** 263. 1891).

The name *Rhipsalis taglionis* occurs in the Index Kewensis Supplement 1, by error for *R. saglionsis.*

Rhipsalis wettsteinii Schumann (Monatsschr. Kakteenk. **17:** 48. 1907) is a name only.

The illustration (fig. 233*a*) given on next page is a reproduction of Plumier's plate 92 of Burman Plantarum Americanum published in 1755 and now referred to *Neoabbottia paniculata,* discussed on page 280 of this volume.

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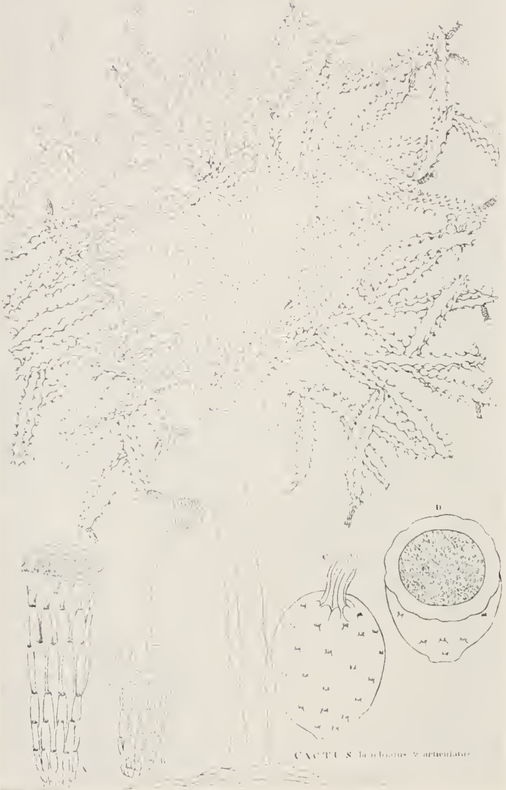


CACTUS fimbriatus β articulatus

APPENDIX.

During the progress of our investigations much information has been received from numerous sources which could not be included in publication at the logical places. Some of this was taken up in the appendix to the first volume (Cactaceae 1: 216-225) and some in the appendix to the second (Cactaceae 2: 223-226); what remains is included in this appendix to the whole work.

Dr. David Griffiths, who studied the species of *Opuntia*, especially with relation to their economic possibilities, and grew many of them at experimental stations of the United States Department of Agriculture at Brownsville, Texas, and at Chico, California, has published and described many species as new. We have included these in our studies of the genus and have grouped them with the species known to us as accurately as has been possible from his published descriptions and illustrations and after examination of as many of his type specimens as we have been permitted to see; however, conditions were such that we have not been able to study a number of them. They have not been arranged for ready reference by students.

The preface to Volume I gives a list of volunteers who have made valuable contributions of specimens and data to this investigation. Many of these have continued to aid us.

Dr. Britton, in continuing his West Indian studies, investigated the cacti of Grenada and of Trinidad in 1920 and 1921 and published an account of the Trinidad species.

Dr. John K. Small has continued his investigation of the southeastern United States and of Florida in particular, in cooperation with Mr. Charles Deering, and has greatly increased our knowledge of the cacti existing there, including the discovery of many undescribed species of *Opuntia*.

Dr. Francis W. Pennell, Curator of Botany at the Academy of Natural Sciences of Philadelphia, and Mr. E. P. Killip, of the United States National Museum, made extensive botanical collections in Colombia in 1922, including some specimens of cacti, which we have studied.

Dr. Henry H. Rusby led the Mulford Biological Exploring Expedition to Bolivia in 1921-1922 and with the assistance of Dr. O. E. White obtained for us specimens of several little-known cacti.

Dr. Philip A. Munz has sent us cacti from the deserts of southern California.

Mr. C. Z. Nelson obtained cacti from southern Mexico, including a beautiful new species of *Selenicereus*.

Mr. Francis J. Dyer, while connected with the Consular Service in Honduras and at Nogales, Mexico, sent us many specimens from those stations.

Professor Harvey M. Hall, while making extensive explorations in the western United States in connection with his own work, has forwarded interesting cactus plants.

Dr. and Mrs. Charles D. Walcott have sent specimens from Alberta, Canada, some of them coming from near the most northern range of the family.

Dr. W. L. Abbott and Mr. E. C. Leonard made extensive collections in Haiti in 1920 and obtained a number of rare and little-known plants, including one which had been collected by Charles Plumier about 1698 and which proved to be a new genus; this was named by us for Dr. Abbott. More recently Dr. Abbott has sent us specimens from Santo Domingo.

Dr. George F. Gaumer, a veteran collector in Yucatan, has sent very important collections from his region, including a number of new species.

Mr. Ivan M. Johnson, who accompanied the scientific expedition sent out by the California Academy of Sciences in 1921 to explore the islands of the Gulf of California, collected many cacti, especially species of *Neomammillaria,* duplicating many of the important discoveries made by Dr. Rose on the same islands in 1911. He has also sent us cacti from Colorado.

Professor Fortunato L. Herrera has sent some very interesting plants from eastern Peru, especially from about his home at Cuzco.

Mr. Robert Runyon has collected extensively in southern Texas and northern Mexico and has supplemented his specimens with some very beautiful photographs.

Dr. L. H. Bailey and his daughter, Miss Ethel Zoe Bailey, obtained valuable cacti from Venezuela, especially from the region about Ciudad Bolívar, on the Orinoco, in 1921.

Mr. W. B. Alexander was sent to Argentina by the Australian Government in 1920 and 1921 in search of enemies of the weed prickly pears and there made many important observations, especially on the genus *Opuntia.* He sent us two undescribed species.

Dr. B. P. Reko, a very diligent collector, has sent many cacti from Mexico, especially from Oaxaca, including several new to science.

Señor Octavio Solís, in charge of the cactus garden belonging to the Mexican Government in the City of Mexico, has sent many living plants from his country, especially of the genus *Neomammillaria.* To him we have dedicated the genus *Solisia.*

Señor J. G. Ortega has collected extensively on the west coast of Mexico, especially in the state of Sinaloa, and for him we have named *Neomammillaria ortegae.*

Mr. J. Francis Macbride and Mr. William Featherstone, who were in charge of the botanical expedition of the Field Museum to Peru in 1922 and 1923, made large and valuable collections of cacti in central and eastern Peru.

Mr. E. C. Rost has collected and photographed many interesting cacti for us in southern California and Lower California.

Dr. W. S. W. Kew explored extensively in Lower California in 1921 and sent not only many specimens but numerous habit photographs.

Mr. James H. Ferriss, while making various excursions through the western United States, has sent in many specimens. Among his interesting discoveries was the finding of *Neomammilaria pottsii* in southern Texas.

Mrs. S. L. Pattison, an enthusiastic collector in western Texas, has sent many valuable specimens, including new species collected by herself or for her by local collectors.

Mrs. Ruth C. Ross spent considerable time in eastern Arizona in 1921 and collected cacti along the route traversed by Emory in 1847, re-collecting certain species which she had discovered at that time.

Mr. Harry Johnson was located for about a year in Guatemala, during which time he sent a number of very interesting cacti, especially species of *Epiphyllum.* Some of these were accompanied by full notes and drawings.

Señor P. Campos-Porto has sent a number of interesting specimens from Brazil belonging to the genus *Rhipsalis.*

The following persons have contributed valuable specimens, usually from about their homes or while engaged in other work: G. W. Goldsmith, Colorado; B. C. Tharp, Texas; Charles O. Chambers, Oklahoma; James S. Holmes, Washington, D. C.; Joseph A. Holmes, Wyoming; William Hertrich, California; William Tell, Texas; Albert Ruth, Texas; D. C. Parman, Texas; Karl Reiche, Mexico; Gerold Stahel, Surinam; Rev. Louis Mille, Ecuador; H. M. Pilkington, Haiti; Percy L. Ports, Washington, D. C.; W. E. Broadway, Trinidad; A. F. Moeller, Mexico; W. E. Meyer, Bolivia; Stephen E. Aguirre, Mexico; Mrs. Elsie McElroy Slater, Texas; Paul C. Standley, Central America; R. D. Camp, Brownsville, Texas; George L. Fisher, Texas; A. V. Fric, Mexico; and Dana Lee, Wyoming.

As treated in this monograph the Cactus family is composed of 3 tribes. The first and second tribes are taken as units, but the third is composed of 8 subtribes. The number of genera recognized is 124 and the number of species is 1,235.

For page references 251 to 266 refer to index of Vol. I.

Corrections and Additions to Volume II.

On page 4, vol. II, under *Cereus hexagonus,* add the synonyms: *Cereus regalis* Haworth, Suppl. Pl. Succ. 75. 1819; *Cactus regalis* Sprengel, Syst. **2:** 476. 1825; *Cereus childsi* Blanc, Cacti 39, No. 375.

Insert: *Cereus cyaneus* Hortus is listed by Berger (Hort. Mortola 69. 1912) as a South American plant grown at La Mortola. From drawings sent by Berger it is probably to be referred to *C. hexagonus.*

Add to illustrations: Andrews, Bot. Rep. **8:** pl. 513; Reichenbach, Fl. Exot. pl. 322; Van Géel, Sert. Bot. **1:** pl. 114, as *Cactus hexagonus;* Blanc, Cacti 39. No. 375, as *Cereus childsi.*

On page 8, vol. II, under *Cereus jamacaru* insert: *Cereus caracore* (Gosselin, Bull. Soc. Acclim. France **51:** 58. 1905) belongs to the group containing *C. jamacaru,* that is, it is a true *Cereus,* according to Gosselin. He does not claim that it is a good species. No species of *Cereus,* however, are natives of Chile, from which this plant is said to have come. If indigenous to that country it is more likely to be *Trichocereus chiloensis.*

On page 9, vol. II, under *Cereus jamacaru,* add to illustrations: Monatsschr. Kakteenk. **26:** 181; Karsten, Deutsche Fl. ed. 2. **2:** 456. f. 605, No. 8.

On page 11, vol. II, under *Cereus peruvianus,* add the synonyms: *Piptanthocereus peruvianus* Riccobono, Boll. R. Ort. Bot. Palermo **8:** 232. 1909; *Piptanthocereus peruvianus monstruosus* Riccobono, Boll. Ort. Bot. Palermo **8:** 233. 1909.

Also add to illustrations: Saint-Hilaire, Exp. Fam. Nat. **2:** pl. 95, in part as f. 1 (?); De Candolle, Pl. Succ. Hist. **1:** pl. 58, as *Cactus peruvianus;* Blanc, Cacti 36. No. 252; Rother, Praktscher Leitfaden Kakteen 15, as *Cereus peruvianus monstrosus;* Karsten and Scheck, Vegetationsbilder **1:** pl. 41; 42, f. b; Gartenwelt **6:** 133; Mem. Acad. Roy. Sci. pl. 4, 5; Haage and Schmidt, Haupt-Verz. **1919:** 134. f. 10737; Goebel, Pflanz. Schild. **1:** f. 5, 53.

On page 14, vol. II, under *Cereus pernambucensis,* add to illustration: Remark, Kakteenfreund 7, as *Cereus formosus monstrosus.*

On page 17, vol. II, under *Cereus aethiops,* add to illustrations: Förster, Handb. Cact. ed. 2. 207. f. 15, as *Cereus landbeckii;* Blanc, Cacti 26. No. 27; Gartenwelt **16:** 537, as *Cereus coerulescens.*

On page 19, vol. II, insert:

25. Cereus trigonodendron Schumann, Bot. Jarb. Engler **40:** 413. 1908.

Simple, or in age with a much branched top, 15 meters high; trunk 5 meters long, smooth, 3 dm. in diameter or more; ribs 3 to 6, 2 to 3 cm. high; areoles in young growth 2 to 3 cm. apart, producing abundant white wool, 1 cm. long or more; spines 4 to 7, at first brown, subulate, 2 to 5.5 cm. long; flowers as in typical species of *Cereus,* 10 to 15 cm. long; fruit smooth, edible.

Type locality: Department of Loreto, Peru.

Distribution: Valleys of eastern Peru and Bolivia.

This species is briefly described on page 19 of volume II of The Cactaceae, but at that time we knew little about it and were disposed to exclude it from the genus *Cereus.* We have since had a photograph of the type specimen from Berlin. In December 1922 F. L. Herrera sent us flowers from the Santa Ana Valley, province of Convención, Peru, and in February 1923 we received herbarium specimens of branches and flowers from W. E. Meyer, collected in 1922 at Cachuela-Esperanza, Boni, Bolivia. It is found only in the Atlantic drainage of Peru and Bolivia and is therefore geographically within the range of the genus *Cereus* as limited by us.

Illustration: Bot. Jahrb. Engler **40:** pl. 10.

Figure 239 is from a photograph sent by Dr. Vaupel from Berlin.

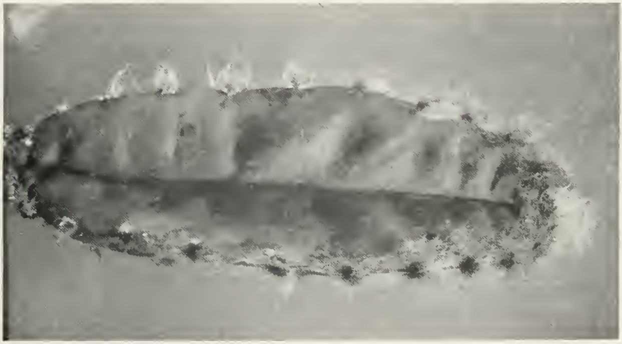


FIG. 239.—Cereus trigonodendron.

On page 20, vol. II, add at end of page: *Cereus amalonga* and its variety *cristata* are described in the Cactus Journal (2: 93, 104, 119) and both are illustrated in the plate for August of that volume. They are said to have been imported from Mexico. We are unable to identfy these plants either from the descriptions or illustrations.

On page 21, vol. II, under *Cereus lormata,* insert: We listed *Cereus lormata* among the species unknown to us but we have since seen an illustration (Wiener Ill. Gart. Zeit. **11:** pl. 3, in part) of a barren plant. It has about 10 vertical ribs with clusters of subulate spines, some of them greatly elongated. It is probably not a true *Cereus.*

On page 21, vol. II, at end of *Cereus* add: *Cereus perviridis* Weingart is advertised by Haage & Schmidt (Cat. 1914). We have seen a cutting but do not know its relationship.

Cereus pitahaya variabilis Weingart (Monatsschr. Kakteenk. **16:** 158. 1906) is only a form and is not described.

Cereus roezlii Haage jr. (Schumann, Gesamtb. Kakteen 64. f. 12. 1897) was described as columnar with 9 obtuse ribs, 9 to 12 radial spines, and one central spine much larger than the radials. Its flowers were unknown. It is said to come from the Andes of Peru or Ecuador. It is probably some species of *Lemaireocereus* or *Trichocereus*.

Cereus stolonifer Weber is listed by Schumann (Monatsschr. Kakteenk. **5**: 43. 1895) as a plant grown in the Botanical Garden in Paris.

Cereus tripteris Salm-Dyck (De Candolle, Prodr. **3**: 468. 1828) was described from barren plants of unknown origin and has never been identified.

Cereus uspenski Haage jr. is mentioned in a report by Karl Hirscht (Monatsschr. Kakteenk. **8**: 109. 1898).

Cereus auratus Labouret (Rev. Hort. IV. **4**: 27. 1855) is a tall *Cereus*-like plant, originally reported as from Peru, but the Index Kewensis says it is from Mexico. The four following varieties: *genuinus*, *intermedius*, *mollissimus*, and *pilosus* are briefly described by Regel & Klein (Ind. Sem. Hort. Petrop. **1860**: 45. 1860); *Pilocereus auratus* (Rümpler in Förster, Handb. Cact. ed. 2. 650. 1885) is doubtless the same.

On page 22, vol. II, under *Monvillea cavendishii*, add to illustrations: Blühende Kakteen **3**: pl. 171, as *Cereus euchlorus*; Blühende Kakteen **3**: pl. 172, as *C. rhodoleucanthus*; Blühende Kakteen **3**: pl. 178, as *C. cavendishii*.

On page 23, vol. II, under *Monvillea spegazzinii*, add the synonyms: *Piptanthocereus spegazzinii* Riccobono, Boll. R. Ort. Bot. Palermo **8**: 233. 1909; *Cereus spegazzinii hassleri* Weingart, Monatsschr. Kakteenk. **32**: 163. 1922.

Add to illustrations: De Laet, Cat. Gén. f. 28, as *Cereus spegazzinii*.

On page 27, vol. II, under *Cephalocereus senilis*, add to illustrations: Journ. Intern. Gard. Club **3**: 640, as *Cephalocereus* sp.; Gard. Chron. III. **32**: 35; Journ. Hort. Home Farm. III. **59**: 625; Amer. Garden **11**: 479; West Amer. Sci. **13**: 16, as *Cereus senilis*; West Amer. Sci. **13**: 23, as *C. hoppenstedtii*; Möllers Deutsche Gärt. Zeit. **25**: 473. f. 5, No. 19; Remark, Kakteenfreund 20, as *Pilocereus hoppenstedtii*; Cact. Journ. **1**: pl. 5; Gartenflora **27**: 114; Deutsche Gärt. Zeit. **6**: 64; Gard. Chron. **1873**: f. 15; Garten-Zeitung **4**: 182. f. 42, No. 6; Gartenwelt **2**: 574; **16**: 175; Watson, Cact. Cult. ed. 2. 260. f. 98; ed. 3. f. 34; West Amer. Sci. **9**: 2; Journ. Intern. Gard. Club **3**: 640; Blanc, Cacti 76. No. 1755; Weinberg, Cacti 26, as *Pilocereus senilis*; Palmer, Cult. Cact. 148, as *Pilocereus*; Engler and Drude, Veg. Erde **13**: f. 30; Tribune Hort. **4**: 283; Möllers Deutsche Gärt. Zeit. **25**: 473. f. 5, No. 3; Schelle Handb. Kakteenk. 108. f. 44, 45; Floralia **42**: 370; Balt. Cact. Journ. **1**: 116.

On page 30, vol. II, under *Cephalocereus fluminensis*, add to illustrations: Goebel Pflanz. Schild. **11**: pl. 3, f. 1 to 3, as *Pilocereus*.

On page 31, vol. II, under *Cephalocereus macrocephalus*, add to illustrations: Möllers Deutsche Gärt. Zeit. **25**: 473. f. 5, No. 2.

On page 32, vol. II, under *Cephalocereus polylophus*, insert: *Pilocereus angulosus* Förster, according to Lemaire (Rev. Hort. **1862**: 428. 1862) is little known; it is perhaps to be referred here.

Add to illustration: Gard. Chron. III. **50**: 135. f. 64, C, as *Cereus polylophus*.

On page 42, vol. II, under *Cephalocereus arrabidae*, insert: The following names relate to this species and other names associated with it: *Pilocereus sublanatus* Förster (Haage, Verz. Cact. 22) is referred to *Cereus sublanatus* by the Index Kewensis. *Pilocereus tilophorus* (Index Kewensis) is evidently a mistake for *Cereus tilophorus*. *Pilocereus oligogonus* Lemaire (Rev. Hort. **1862**: 428. 1862) is said to come from Mexico; the two varieties, *houlletianus* and *sublanatus*, given at this same place as synonyms, may or may not belong with it; they should doubtless be referred to the species bearing the same names respectivly.

Add to illustrations: Möllers Deutsche Gärt. Zeit. **25**: 473. f. 5, No. 9, as *Pilocereus exerens*.

On page 44, vol. II, under *Cephalocereus nobilis*, add the synonyms *Cereus polyptychus* Lemaire, Cact. Gen. Nov. Sp. 56. 1839; *Pilocereus polyptychus* Rümpler in Förster, Handb. Cact. ed. 2. 680. 1885.

Insert: The plant upon which this name was based was a small, barren one of unknown origin.

Insert: *Pilocereus houlletianus niger* (Förster, Handb. Cact. ed. 2. 676. 1885) is only a name given as a synonym of *P. niger*, while *P. niger aureus* is briefly described on the same page.

Add to illustrations: Möllers Deutsche Gärt. Zeit. **25:** 473. f. 5, No. 4, as *Pilocereus curtisi.*

On page 47, vol. II, under *Cephalocereus polygonus*, add the synonym: *Cephalocereus schlumbergeri* Urban, Symb. Antill. **8:** 464. 1920.

On page 49, vol. II, under *Cephalocereus lanuginosus*, add the synonym: *Pilocereus lanuginosus virens* Salm-Dyck in Förster, Handb. Cact. ed. 2. 672. 1885.

Insert: Curran reports that this fruit is edible (Inventory No. 50. p. 50. U. S. Dept. Agr. Bur. Plant Industry).

On page 51, vol. II, under *Cephalocereus royenii*, add to illustrations: Journ. N. Y. Bot. Gard. **15:** pl. 133, 134.

On page 52, vol. II, under *Cephalocereus leucocephalus*, add to illustrations: Watson, Cact. Cult. 145. f. 56; Deutsche Gärt. Zeit. 7: 312, as *Pilocereus houlletianus;* Gard. Chron. III. 29: f. 79. as *P. houlletianus leucocephalus;* Möllers Deutsche Gärt. Zeit. **25:** 473. f. 5, No. 14, as *P. cometes;* De Laet, Cat. Gén. No. 51, 52, 53; Möllers Deutsche Gärt. Zeit. **25:** 473. f. 5, No. 7; Blühende Kakteen **2:** pl. 79; West Amer. Sci. **13:** 24; Schelle, Handb. Kakteenk. 101. f. 40, as *P. houlletii;* Gard. Chron. III. **32:** 253, as *Cereus houlleti.*

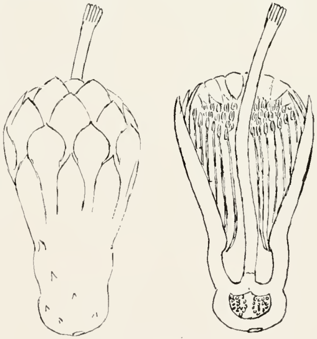
On page 56, vol. II, under *Cephalocereus purpusii*, insert: Wilhelm Weingart, under date of June 18, 1921, wrote of this species as follows:

> "*Cephalocereus purpusii* sp. nov. was collected by C. A. Purpus in 1902 near Mazatlán, was sent to me February 18, 1907, and bloomed in Darmstadt in 1918."

Figures 240 and 241 are reproduced from a drawing furnished by Wilhelm Weingart.

On page 56, vol. II, under *Cephalocereus catingicola*, add to illustrations: Vegetationsbilder 6: pl. 14, as *Cereus catingicola;* Engler, Bot. Jahrb. **40:** Suppl. pl. 5, as *C. catingae.*

On page 58, vol. II, insert:



FIGS. 240, 241.—Cephalocereus purpusii, flower.

49. **Cephalocereus collinsii** sp. nov.

About 3 meters high with few slender, elongated branches, these 3 to 4 cm. in diameter; ribs about 7, obtuse; tubercles about 1.5 cm. apart, circular, long-woolly as well as spiny; flowering areoles not much more woolly than the others; spines numerous, acicular, longer ones 3 to 4 cm. long; flowers borne near ends of branches, about 5 cm. long; fruit somewhat depressed, about 3 cm. broad; seed shining, black, 1.5 to 2 mm. broad.

Common in thickets near Tehuantepec, Oaxaca, Mexico. The type was collected by Dr. C. A. Purpus near Gerónimo in April 1923. It was reported by O. F. Cook and G. N. Collins from this region in 1902. The plant is named for Mr. Collins, who first brought it to our attention more than 20 years ago while carrying on field work in southern Mexico for the U. S. Department of Agriculture.

Figure 242 is from a photograph taken by Mr. Collins in 1902; it is three-fourths natural size.

On page 58, vol. II, under *Cephalocereus hermentianus,* add: *Illustration:* Möllers Deutsche Gärt. Zeit. **25:** 473. f. 5, No. 10, as *Pilocereus hermentianus.*

On page 58, vol. II, under *Pilocereus albisetosus.* add the synonyms: *Cactus albisetosus* Sprengel, Syst. **2:** 496. 1825; *Cactus albisetus* Steudel, Nom. ed. 2. **1:** 245. 1840.

On page 61, vol. II, under *Espostoa lanata,* add to illustrations: Schelle, Handb. Kakteenk. 105. f. 41, as *Pilocereus lanatus;* Schelle, Handb. Kakteenk. 105. f. 42, as *P. lanatus cristatus;* Wiener Ill. Gart. Zeit. **11:** pl. 3, in part, as *P. dautwitzii.*

On page 64, vol. II, under *Stetsonia coryne*, insert: W. B. Alexander wrote, under date of March 7, 1921, as follows:

> "Noticing your statement that the fruit of *Stetsonia coryne* is unknown, I obtained a ripe specimen at La Rioja for you and am sending it by parcel post."

This we describe as follows:

> Oblong, 6 cm. long, glabrous, bearing scattered scales, these 5 mm. broad, 1 mm. high, each with a cartaceous tip and a denticulate margin; seeds numerous, small, 1.5 mm. long, flattened, pitted; hilum large, basal.

On page 65, vol. II, under *Stetsonia coryne.* add to illustrations: Thomas, Zimmerkultur Kakteen 11, as *Cereus coryne.*

On page 66, vol. II, under *Escontria chiotilla.* add to illustrations: Möllers Deutsche Gärt. Zeit. **29:** 438. f. 13; Floralia **42:** 389, as *Cereus chiotilla.*

On page 69, vol. II, under *Pachycereus pringlei.* insert: The distribution of *Pachycereus pringlei* in northern Sonora is not well defined. Dr. MacDougal has recently visited northwestern Sonora and states that he saw it along the route between Altar and Port Libertad to within a hundred miles of the United States boundary. Prospectors and ranchers also speak of it as being abundant in the valley of the Asuncion or Altar River some miles to the northward. He writes of it as follows:

> "On the whole, however, my chief interest was centered on the sowesa or *Pachycereus pringlei.* We began to get into this about 85 miles from the Gulf, and in the region below a thousand feet it attains perfectly tremendous size, as you will see from some photographic prints."

Figure 243 is from a photograph obtained by Dr. MacDougal at Port Libertad, Sonora, May 4, 1923.

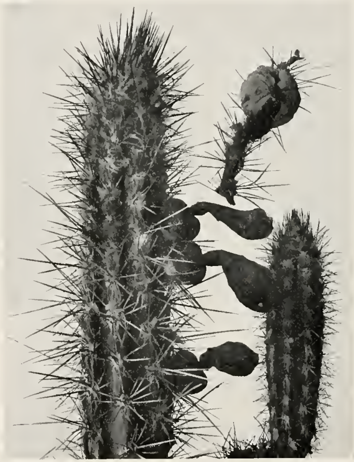


Fig. 242.—Cephalocereus collinsii.

Also add to illustrations: Zeitschr. Ges. Erdk. **1916:** f. 6, in part; Contr. U. S. Nat. Herb. **16:** 131, A; 132, A; Karsten and Schenck, Vegetationsbilder **13:** pl. 13, as *Pachycereus calvus;* Contr. U. S. Nat. Herb. **16:** pl. 131, B, as *P. titan;* Ann. Rep. Smiths. Inst. **1908:** 553. f. 17.

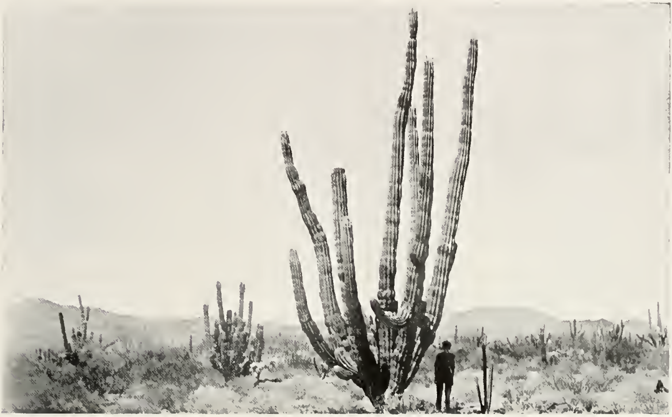


FIG. 243.—Pachycereus pringlei.

On page 71, vol. II, under *Pachycereus pecten-aboriginum,* add to illustrations: Engler and Drude, Veg. Erde **13:** 297. f. 9; Watson, Cact. Cult. ed. 2. 246. f. 92; ed. 3. f. 17; Karsten and Schenck, Vegetationsbilder **1:** pl. 48, as *Cereus pecten-aboriginum;* Karsten and Schenck, Vegetationsbilder **13:** pl. 14; Contr. U. S. Nat. Herb. **16:** pl. 132, B.

On page 71, vol. II, under *Pachycereus gaumeri,* add additional characters:

Ribs sometimes only 3, thin, 3 to 4 cm. high; areoles sometimes 2.5 cm. apart; fruit becoming dry, globose, 3 to 4 cm. in diameter, scales at base of fruit small, becoming long and foliaceous above, fleshy at base but tips thin and soon drying black; axils of scales felted, with a cluster of about 8 very short black spines; seeds numerous, brown, 4 mm. long.

The above description is drawn from specimens sent by Dr. Gaumer to Washington in June 1922.

On page 73, vol. II, under *Pachycereus chrysomallus,* add to illustrations: Reiche, Elem. Bot. 226. f. 162, as *Pilocereus;* Möllers Deutsche Gärt. Zeit. **29:** 297. f. 5; U. S. Dept. Agr. Bur. Pl. Ind. Bull. **262:** pl. 13, f. 1, as *Pilocereus fulviceps;* Floralia **42:** 377; Belg. Hort. **3:** pl. 57, as *P. chrysomallus;* Möllers Deutsche Gärt. Zeit. **25:** 473. f. 5, No. 1.

On page 74, vol. II, under *Pachycereus marginatus,* insert: The two varieties, *Cereus marginatus monstrosus* (Monatsschr. Kakteenk. **19:** 62. 1909) and *C. marginatus cristatus* (Monatsschr. Kakteenk. **4:** 194. 1894) occur in the trade.

Also add to illustrations: West Amer. Sci. **13:** 6; Möllers Deutsche Gärt. Zeit. **25:** 472. f. 2, No. 15; De Laet, Cat. Gén. f. 23; Möllers Deutsche Gärt. Zeit. **29:** 355. f. 11; Bot. Jahrb. Engler **58:** Beibl. **129:** 27. f. 9, as *C. marginatus;* Remark, Kakteenfreund 7; Karsten and Schenck, Vegetationsbilder **1:** pl. 43; 48, as *Cereus gemmatus;* Ann. Rep. Smiths. Inst. **1908:** pl. 11, f. 2.

On page 76, vol. II, under *Pachycereus lepidanthus,* insert: Since the appearance of volume II, we have received flowers of this species from Wilhelm Weingart, which show a very close likeness to those of *Escontria chiotilla.* The fruit of the latter, however, is a juicy edible berry, while that of the former is described as dry. The illustrations here printed may lead to the rediscovery of this rare plant.

Figure 244 is from a photograph of a plant grown in Washington, showing a joint as it came from the field and also the young growth as developed in the greenhouse; figure 245 is from a photograph of two flowers and a spine-cluster.

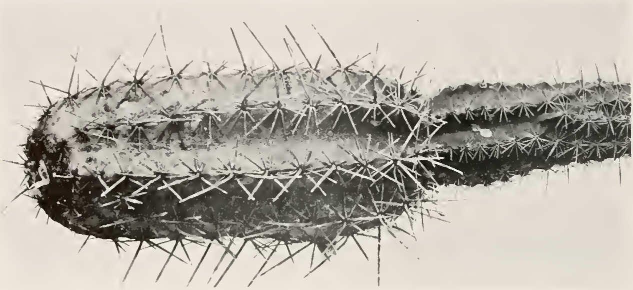


Fig. 244.—Pachycereus lepidanthus.

On page 78, vol. II, under *Leptocereus leonii,* insert: Specimens collected in June 1923, by Brother León and Dr. Roig on Loma de Somorrostro, Jamaica, Havana Province, Cuba, show that the fruit of this species becomes 6.5 cm. long by 5.5 cm. thick, when fully mature. The fruits are borne near the ends of the branches, 3 or 4 close together.

On page 76, vol. II, under *Cereus tetazo,* insert: *Pilocereus tetetzo cristatus* Weber (Schumann, Gesamtb. Kakteen 176. 1897) is only a name and so is *Cephalocereus tetetzo* (Monatsschr. Kakteenk. 19: 73. 1909) and *Cereus tetezo* and *C. tetetzo* (Monatsschr. Kakteenk. 17: 79. 1907).

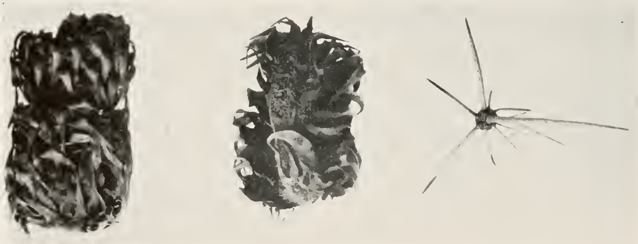


Fig. 245.—Pachycereus lepidanthus.

Also insert: *Illustration:* Bull. Soc. Nat. Acclim. **52:** 55. f. 14, as *Cereus tetezo.*

On page 82, vol. II, under *Eulychnia spinibarbis,* add to illustrations: Engler and Drude, Veg. Erde **8:** pl. 5, f. 11, as *Cereus coquimbanus.*

On page 86, vol. II, under *Lemaireocereus hollianus*, add to illustrations: Bull. Soc. Nat. Acclim. **52:** 45. f. 9, as *Cereus bavosus*.

On page 86, vol. II, under *Lemaireocereus hystrix*, add the synonym: *Cactus americanus* Vitman, Summa Pl. **3:** 209. 1789.

Insert: *Cactus americanus* is based on Bradley's illustration (Hist. Succ. Pl. 12) which De Candolle referred to *Cereus eburneus*, but as the plant came from the West Indies it is perhaps better referred to *Lemaireocereus hystrix*.

Also insert: We have recently obtained from N. E. Brown a photograph of Haworth's *Cereus hystrix*, with the date, "Oct. 24. 1824."

On page 87, vol. II, under *Lemaireocereus griseus*, add to illustrations: Monatsschr. Kakteenk. **24:** 5, as *Cereus eburneus;* Ann. Rep. Smiths. Inst. **1908:** pl. 9, f. 5.

On page 89, vol. II, under *Lemaireocereus eichlamii*, add to the description:

Fruit globular, about 5 cm. in diameter, becoming dry, not edible, thin-skinned, filled with numerous large seeds, the surface bearing scattered areoles, these densely short-felted with clusters of short spines subtended by small, ovate, acute scales; seeds black, 4 to 5 mm. long with a prominent hilum.

Insert: This plant is much used for hedges in Salvador and was obtained there by Mr. Paul C. Standley in the vicinity of Sonsonate, altitude 220 to 300 meters, March 1922 (No. 22328), but was not seen in the wild state. It is called there órgano. This species heretofore has been known only from Guatemala and was not known to us in fruit; this differs from that of the other species of *Lemaireocereus* in being rather dry with very large seeds.

Also insert: Figure 246 is from a photograph of the plant, sent by F. Eichlam in 1909 to Washington, which flowered in 1918.

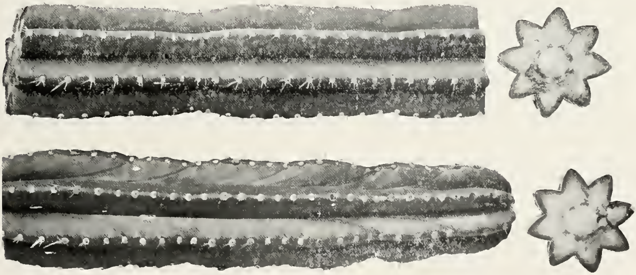


Fig. 246.—Lamaireocereus eichlamii.

On page 91, vol. II, under *Lemaireocereus chende*, add to illustrations: Grässner, Haupt-Verz. Kakteen **1912:** 3, as *Cereus del moralii*.

On page 96, vol. II, under *Lemaireocereus weberi*, add to illustrations: Floralia **42:** 388, as *Cereus candelabrum*.

On page 96, vol. II, insert:

14a. Lemaireocereus beneckei (Ehrenberg).

Cereus beneckei Ehrenberg, Bot. Zeit. *2:* 835. 1844.
Cereus farinosus Haage in Salm-Dyck, Allg. Gartenz. *13:* 355. 1845.
Cereus beneckei farinosus Salm-Dyck, Cact. Hort. Dyck. 1849. 49. 1850.
Piptanthocereus beneckei Riccobono, Boll. R. Ort. Bot. Palermo *8:* 226. 1909.

Plants 4 to 5 meters high, much branched; branches 6 to 7 cm. in diameter, the growing tips very glaucous; ribs 7 or 8, strongly tuberculate, obtuse, separated by narrow intervals; areoles small, circular, borne on the upper side of the tubercle, brown to black-felted; spines 1 to 7, acicular, the longest sometimes 2.5 cm. long, brown to black; flowers night-blooming, small, 4 cm. long, greenish brown without; inner perianth-segments rose-colored to white (?); ovary globose, glaucous, tuberculate, its areoles brown-felted and bearing 3 to 7 acicular spines, the longest sometimes 2.5 cm. long and brown to black; fruit about 2 cm. in diameter, somewhat tubercled, bearing clusters of spines at the areoles, red; pericarp thick, somewhat fleshy; pulp disappearing, leaving the large seeds loose, these escaping by a basal pore as in *Oreocereus* and many of the *Echinocactanae*.

Type locality: Mexico on red lava beds.

Distribution: Central Mexico.

In volume II of The Cactaceae (p. 18), we described this plant under *Cereus* but with the statement that it was not a true *Cereus;* we were not then able to refer it to any known genus. At that time we knew little about the flowers and nothing accurate about the ovary and fruit. In 1921 Professor K. Reiche sent us some living plants from Iguala, the station from which Dr. Rose obtained his plants in 1905. These contained some old withered flowers and some well-developed ovaries which have enabled us to refer the plant to *Lemaireocereus*.

Figure 247 is from a photograph of K. Reiche's plant, slightly reduced, showing the top of a branch bearing an old flower and a half-ripe fruit.

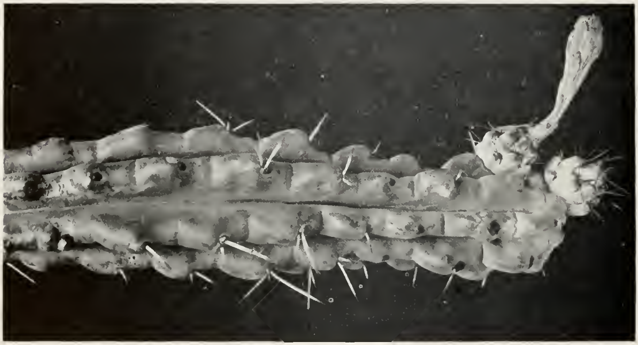


FIG. 247 —Lemaireocereus beneckei.

On page 98, vol. II, under *Lemaireocereus thurberi,* add to illustrations: Journ. N. Y. Bot. Gard. **3:** f. 13, as *Cereus thurberi;* Bull. U. S. Nat. Mus. **56:** pl. 8, f. 2; Karsten and Schenck, Vegetationsbilder **13:** pl. 15: 21, f. A; Contr. U. S. Nat. Herb. **16:** pl. 125, A; Amer. Bot. **20:** 88.

On page 108, vol. II, under *Bergerocactus emoryi,* add to illustrations: Cact. Journ. **1:** 59; Gartenwelt **11:** 498, as *Cereus emoryi.*

On page 111, vol. II, under *Wilcoxia poselgeri,* add to illustrations: Remark, Kakteenfreund 6; Deutsche Garten-Zeitung **1886:** f. 25, as *Cereus tuberosus.*

On page 111, vol. II, under *Wilcoxia striata*, insert: According to T. S. Brandegee (under date of June 8, 1921), the flowers of *Wilcoxia striata* are nocturnal.

On page 112, vol. II, under *Peniocereus greggii*, add to illustrations: Amer. Gard. **11:** 474, as *Cereus greggii;* Journ. Wash. Acad. **12:** 329. f. 1; Succulenta **4:** 71.

On page 113, vol. II, insert:

2. **Peniocereus johnstonii** Britton and Rose, Journ. Wash. Acad. **12:** 329. 1922.

A climbing or clambering plant, up to 3 meters long, with a very large fleshy root sometimes weighing 14 pounds; stems and branches 3 to 5-angled, the young growth not pubescent; spines 9 to 12, brown to black, glabrous; upper radial spines short, stubby, swollen at base, nearly black, the two lower light brown, elongated, bristle-like, reflexed; central spines 1 to 3, subulate, 4 to 8 mm. long; flower (only an old flower seen) about 15 cm. long; perianth-segments about 3 cm. long; the lower and outer ones bearing tawny hairs and long bristles; flower-tube slender, with prominent areoles on knobby projections and bearing tawny wool and bristly spines; fruit ovoid to oblong, about 6 cm. long, bearing prominent clusters of black spines, dry (?), many-seeded; seeds oblong, 3 mm. long or more, black, shining; seedling dark purple; cotledons very thick, triangular.

Type locality: San Josef Island, off the east coast of southern Lower California.

Distribution: Southern Lower California.

This plant was always found growing up through bushes of *Olneya tesota.*

Illustrations: Journ. Wash. Acad. **12:** 330. f. 2; Succulenta **4:** 73.

Figure 248 shows a branch, old flowers, and seeds of the type specimen.

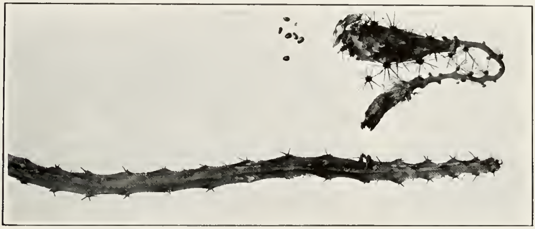


Fig. 248.—Peniocereus johnstonii, showing branch, old flower, and seeds.

On page 113, vol. II, under *Dendrocereus nudiflorus*, insert: In 1922 Dr. L. H. Bailey sent us two photographs and some stem-sections (No. 806) which he had obtained from the Botanic Garden at Roseau, Dominica. It grows as a low, rounded, much branched bush with the outer joints often pendent. Mr. Joseph Jones, curator of the Botanic Garden, wrote that the group is made up of six plants which have not been cut back or interfered with in any way and have experienced two hurricanes without having a piece broken off. One of our colleagues, Dr. William R. Maxon, who had rediscovered this plant some years ago in Cuba, suggested that the plant grown in Dominica might be that species; a careful study of our material convinces us that he is correct. *Dendrocereus nudiflorus*, however, is naturally a large tree with a very definite trunk and a large, much branched top. An explanation of this inconsistency is that the Dominican plant was doubtless grown from cuttings, causing it to assume this bushy habit, a phenomenon also observed in other cacti.

Also insert: *Cereus undiflorus* is a misspelling, used by Sauvalle (Fl. Cuba 59. 1873) and reprinted in the Index Kewensis (**1:** 493).

Figure 249 is from one of the photographs sent us by Dr. Bailey.

On page 116. vol. II, under *Machaerocereus eruca*. add to illustrations: Journ. Intern. Gard. Club **3:** 641; Karsten and Schenck, Vegetationsbilder **13:** pl. 16, as *Cereus eruca.*

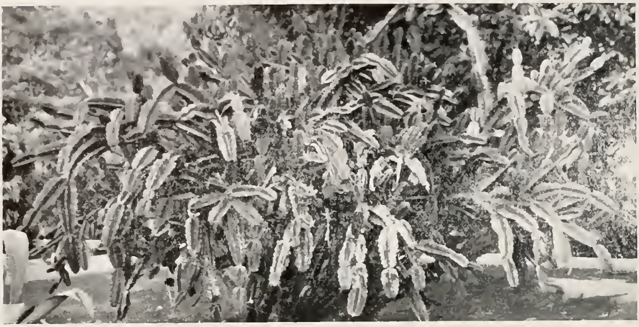


FIG. 249.—Dendrocereus nudiflorus.

On page 117, vol. II, under *Machaerocereus gummosus*, add to illustrations: Cact. Journ. **2:** 107, as *Cereus gummosus;* Zeitschr. Ges. Erdk. **1916:** f. 6, in part; Karsten and Schenck, Vegetationsbilder **13:** pl. 17, f. A.

On page 119, vol. II, under *Nyctocereus serpentinus*, add to illustrations: Watson, Cact. Cult. 67. f. 16; ed. 3. f. 12, as *Cereus serpentinus.*

On page 119, vol. II, under *Nyctocereus guatemalensis,* add to illustrations: Monatsschr. Kakteenk. **31:** 41, as *Cereus hirschtianus.*

On page 123, vol. II, under *Acanthocereus pentagonus*. add to illustrations: De Laet, Cat. Gén. f. 32, as *Cereus baxaniensis;* Monatsschr. Kakteenk. **32:** 21, as *C. princeps.*

On page 125, vol. II, insert the following:

3a. **Acanthocereus floridanus** Small, sp. nov.

Stems and branches diffusely spreading or reclining, 3 to 10 meters long, stout: joints prominently 3 to 5-angled, but mostly 3-angled, dark green, often forming impenetrable thickets: areoles remote, with mostly 4 to 7 slender or subulate spines, the central one often 1 to 2 cm. long: ovary stout-trumpet-shaped, 8 to 10 cm. long, with few large, separated tubercled areoles at the base, bearing mostly 3 to 5 diverging spines, those on the upper part usually with one spine each; outer perianth-segments deltoid to triangular-lanceolate or lanceolate-subulate and almost linear, the longer ones 3.5 to 4 cm. long, acuminate; inner perianth-segments broadly linear, 3.5 to 4.5 cm. long, about six times as long as wide, broadly acuminate; filaments adnate more than halfway up from the base of the hypanthium; anthers less than 2.5 mm. long.

Hammocks, along or near the coast, southern peninsular Florida, adjacent islands, and Florida Keys. Type collected by J. K. Small, on Key Largo, December 1917 and 1918; preserved in the herbarium of the New York Botanical Garden.

This Florida plant has been referred by us to *A. pentagonus*, but specimens recently collected by Dr. Small, including good flowers, which we had not seen before, indicate it to be a distinct species, characterized by its much shorter perianth and more spiny ovary.

Illustrations: Britton and Rose, Cactaceae 2: 123. f. 182; 124. f. 184, as *Acanthocereus pentagonus.*

On page 129, vol. II, under *Heliocereus speciosus*, add to the illustrations: Herb. Génér. Amat. 4: pl. 244; Colla, Hort. Ripul. pl. 10; Bonpl. Descr. Pl. Rar. pl. 3, as *Cactus speciosus;*

Maund, Bot. **1:** pl. 12, as *C. speciosus lateritius;* Curtis's Bot. Mag. **49:** pl. 2306; Edwards's Bot. Reg. **6:** pl. 486, as *C. speciosissimus;* Edwards's Bot. Reg. **19:** pl. 1596, as *C. speciosissimus lateritius;* Newman, Illustr. Bot. 209; Abh. Bayer. Akad. Beschr. Cact. **2:** pl. 3, f. 5; De Laet, Cat. Gén. f. 24, as *Cereus speciosus;* Lindley, Veg. King. ed. 3. 746. f. 498; Curtis's Bot. Mag. **67:** pl. 3822; The Garden **53:** 153, as *C. speciosissimus*; Illustr. Hort. **32:** pl. 548, as *C. speciosissimus hoveyi;* Sci. Amer. **124:** 492, as *Heliocereus mallisoni;* Van Géel, Sert. Bot. **1:** 116, as *Cactus speciosissimus.*

On page 129, vol. II, under *Heliocereus cinnabarinus,* add: *Illustration:* Monatsschr. Kakteenk. **32:** 54, 55, as *Cereus cinnabarinus.*

On page 129, vol. II, under *Heliocereus amecamensis,* add to illustrations: Rother, Praktischer Leitfaden Kakteen 74, as *Cereus amecamensis.*

On page 132, vol. II, under *Trichocereus spachianus,* add to illustrations: Remark, Kakteenfreund 5, as *Cereus spachianus.*

On page 133, vol. II, under *Trichocereus pasacana,* insert: The name *Cephalocereus pasacana* (Engler and Prantl, Pflanzenfam. **3**^{6a}**:** 182. 1894) has been used for this plant.

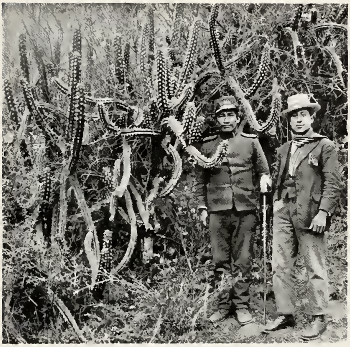


FIG. 250.—Borzicactus fieldianus.

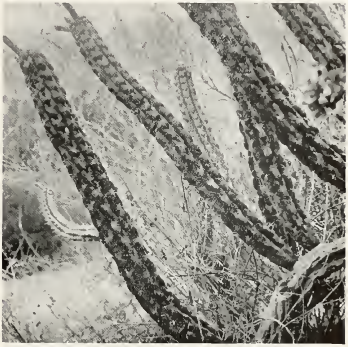


FIG. 251.—Borzicactus fieldianus.

On page 136, vol. II, *Trichocereus macrogonus,* add: *Illustrations:* Garten-Zeitung **4**^{a}**:** 182. f. 8, as *Cereus macrogonus.*

On page 140, vol. II, under *Trichocereus coquimbanus,* add to illustrations: Engler and Drude, Veg. Erde **8:** pl. 16, as *Cereus nigripilis.*

On page 140, vol. II, under *Trichocereus terscheckii,* insert: This cactus is the only timber found in the region of the Puna and in the western mountains of Argentina that can be utilized in any form. It is employed on a large scale in the mines for timbering the galleries, if these happen to be dry. It is called cardón.

Add: *Illustration:* Sci. Amer. **124:** 492.

On page 143, vol. II, under *Trichocereus candicans,* insert: The names *Cereus gladiatus vernaculatus Monville* (Labouret, Monogr. Cact. 327. 1853) and *C. gladiatus courantii* (Förster, Handb. Cact. ed. 2. 833. 1885) were given as synonyms of *C. candicans.*

Cereus candicans dumesnilianus is figured and briefly described in the Gardeners' Chronicle (III. **26:** 415. f. 132). It is an upright plant with long, straight spines; the flowers are large and pure white. It flowered in the collection of Justus Corderoy.

On page 144, vol. II, under *Trichocereus schickendantzii,* add to illustration: Möllers Deutsche Gärt. Zeit. **25:** 475. f. 7, No. 16, as *Echinopsis schickendantzii.*

On page 146, vol. II, under *Echinopsis catamarcensis,* add: *Illustration:* Möllers Deutsche Gärt. Zeit. **25:** 475. f. 7, No. 19.

On page 149, vol. II, under *Harrisia eriophora,* add to illustration: Journ. N. Y. Bot. Gard. **11:** 234. f. 34; Roig. Cact. Fl. Cub. pl. [5], as *Harrisia undata.*

Insert: *Cactus peruvianus jamaicensis* appears in Grisebach's Flora (Fl. Brit. W. Ind. 301. 1860) as a synonym of *Cereus eriophorus,* but refers to *Harrisia gracilis.*

On page 151, vol. II, under *Harrisia nashii,* add: *Illustration:* Descourtilz, Fl. Med. Antill. **1:** pl. 66, as *Cactus divaricatus.*

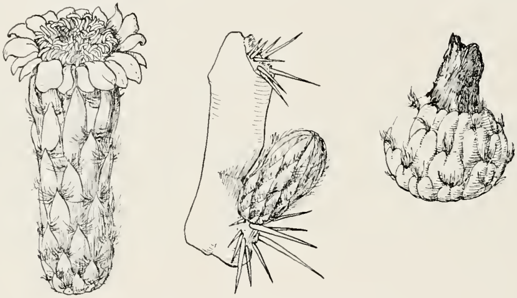
On page 151, vol. II, under *Harrisia gracilis,* add the synonym: *Cactus subrepandus* Sprengel, Syst. **2:** 495. 1825.

Add to illustrations: Förster, Handb. Cact. ed. 2. f. 139; Blühende Kakteen **2:** pl. 84; Watson, Cact. Cult. 85. f. 28; ed. 3. f. 19; Dict. Gard. Nicholson Suppl. 220. f. 255, as *Cereus repandus;* Addisonia **2:** pl. 61.

On page 154, vol. II, under *Harrisia aboriginum,* add: *Illustration:* Journ. N. Y. Bot. Gard. **22:** pl. 253.

On page 155, vol. II, under *Harrisia martinii,* add to illustrations: Addisonia **2:** pl. 68.

On page 157, vol. II, under *Harrisia bonplandii,* add to illustrations: Monatsschr. Kakteenk. **25:** 3, as *Cereus bonplandii.*



FIGS. 252, 253, 254.—Borzicactus fieldianus.

On page 163, vol. II, insert:

9. **Borzicactus fieldianus** sp. nov.

Forming thickets 3 to 6 meters high, the branches elongated, at first erect or ascending but sometimes becoming pendent or even prostrate; ribs few, perhaps only 6 or 7, stout, broad, 1 to 2 cm. high, depressed between the areoles and on young shoots and appearing as tubercled; areoles large, circular, short-lanate and spiny, with a depression extending upward from its upper side to constriction of rib; spines 6 to 10, white, subulate, very unequal, the longest ones 5 cm. long or longer; flowers several, from near tip of branches, but with only one from an areole, with a cylindric tube 6 to 7 cm. long and a very narrow limb; ovary and flower-tube bearing ovate, acute scales, 1 to 3 mm. long, these with long brown hairs in their axils; flower-tube within glabrous below its throat, bearing many stamens 4 cm. long; perianth-segments red, 1 cm. long; stamens exserted only beyond the perianth-segments, if at all; ovary globular, perhaps somewhat tuberculate, with scattered, long-hairy areoles; fruit probably fleshy, globular to ovoid, 2 cm. in diameter.

Collected by Macbride and Featherstone on gravelly river bluffs, eastern exposure at Huaraz, Peru, altitude about 2,600 meters, October 6, 1922 (No. 2519).

This very interesting plant we have named in honor of Captain Marshall Field, a patron of science, who financed the Botanical Expedition of 1922 to South America, sent out by the Field Museum of Natural History.

Figure 250 shows the habit of the plant, 251 a flowering branch, and figures 252 to 254 show flower, rib, and fruit.

On page 164, vol. II, under *Carnegiea gigantea,* add to illustrations:* Remark, Kakteenfreund 19. as *Pilocereus giganteus;* Nat. Geogr. Mag. 41: 373, as giant cactus; Tribune Hort. 4: 243; Journ. N. Y. Bot. Gard. 3: f. 15, 16, 17; 5: 173. f. 27; 6: f. 31, 32; Gartenwelt 8: 485; 11: 498; Schelle, Handb. Kakteenk. f. 20, 21; Cact. Mex. Bound. frontispiece; Bull. U. S. Nat. Mus. 56: pl. 8, f. 1; Useful Wild Pl. U. S. Canada opp. 112; Gartenflora 54: 589. f. 70; Gard. Chron. II. 20: 265. f. 39; Rev. Hort. IV. 3: 343. f. 20; Wiener Ill. Gart. Zeit. 11: 216. f. 47; Watson, Cact. Cult. 76. f. 22; Balt. Cact. Journ. 1: 67; Blanc, Cacti 30. No. 120; Carnegie Institution of Washington 6: pl. 1; De Laet, Cat. Gén. f. 26; Monatsschr. Kakteenk. 32: 87, as *Cereus giganteus;* Contr. U. S. Nat. Herb. 16: pl. 7; Amer. Bot. 26: 136; Stand. Cycl. Hort. Bailey; 1: pl. 3; 2: f. 819; Nat. Geogr. Mag. 44: 171.

On page 167, vol. II, for *Binghamia melanostele,* substitute for this name:

Binghamia multangularis (Willdenow).

Cactus multangularis Willdenow, Enum. Pl. Suppl. 33. 1813.
Cereus multangularis Haworth, Suppl. Pl. Succ. 75. 1819.
Echinocereus multangularis Rumpler in Förster, Handb. Cact. ed. 2. 825. 1885.
Cephalocereus melanostele Vaupel, Bot. Jahrb. Engler 50: Beibl. *111:* 12. 1913.
Binghamia melanostele Britton and Rose, Cactaceae *2:* 167. 1921.

Insert: We have recently obtained a photograph of Haworth's plant bearing the date "Oct. 29, 1824." A careful comparison of this photograph with photographs and specimens obtained by Dr. Rose in Peru in 1914 convinces us that this is the same plant as *Cephalocereus melanostele* which we referred to *Binghamia.*

Figure 255 is from a photograph of Haworth's plant, from N. E. Brown of Kew.

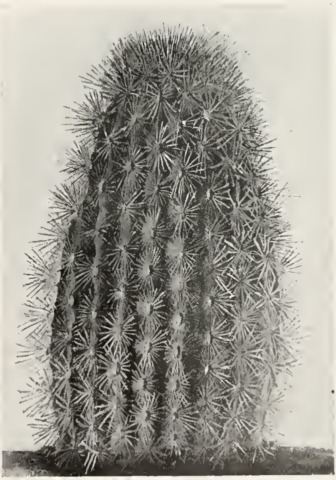


FIG. 255.—Binghamia multangularis.

On page 171, vol. II, under *Oreocereus celsianus,* add to illustrations: Karsten and Schenck, Vegetationsbilder 7: pl. 42; Möllers Deutsche Gärt. Zeit. 25: 473. f. 5, No. 11, as *Pilocereus celsianus;* Möllers Deutsche Gärt. Zeit. 25: 473. f. 5, No. 6, as *P. kranzleri;*† Watson, Cact. Cult. 146. f. 57, as *P. bruennowii;* Balt. Cact. Journ. 1: 133, as *P. fossulatus;* Monatsschr. Kakteenk. 31: 123; 32: 9; Gartenflora 62: f. 55, as *Cereus straussii;* Möllers Deutsche Gärt. Zeit. 25: 475. f. 5, No. 15, as *P. williamsii;* Amer. Mus. Journ. 16: 39; Bull. Pan Amer. Union 42: 408.

On page 174, vol. II, under *Cleistocactus baumannii,* add to illustrations: Deutsches Mag. Gart. Blumen. 1851: pl. opp. 48, as *Cereus tweediei;* Jard. Fleur. 1: pl. 48; De Laet, Cat. Gén. f. 25; Blanc, Cacti 24. f. 2; West Amer. Sci. 13: 8, as *Cereus colubrinus.*

On page 177, vol. II, under *Lophocereus*

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* Some of the illustrations cited here and on pages 166 and 167 do not have the technical name of the plants.
† This name is credited to Rümpler but he gives the spelling as *Pilocereus kanzleri.*

schottii, add to illustrations: Karsten and Schenck, Vegetationsbilder **13:** pl. 18, in part; Contr. U. S. Nat. Herb. **16:** pl. 126, B, as *Lophocereus australis;* Möllers Deutsche Gärt. Zeit. **25:** 473. f. 5, No. 8; Cycl. Amer. Hort. Bailey **3:** f. 1803; Schumann, Gesamtb. Kakteen f. 7, 8; Nachtr. f. 8; Monatsschr. Kakteenk. **11:** 10; **18:** 101, as *Pilocereus schottii;* West Amer. Sci. **13:** 16, as *Cereus sargentianus;* Rep. Mo. Bot. Gard. **16:** pl. 4, 5, 6, 7, 8, as *Cereus schottii;* Contr. U. S. Nat. Herb. **16:** pl. 125, B, as *Lophocereus schottii;* Thomas, Zimmerkultur Kakteen 17, as *Pilocereus sargentianus.*

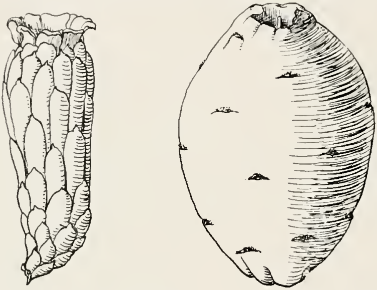
On page 180, vol. II, under *Myrtillocactus geometrizans*, add to illustrations: Reiche, Elem. Bot. 228. f. 164; Engler and Drude, Veg. Erde **13:** f. 31; Möllers Deutsche Gärt. Zeit. **25:** 482. f. 13; West Amer. Sci. **13:** 15; Zeitschrift Sukkulenk. **1:** 31, as *Cereus geometrizans.*

On page 180, vol. II, under *Myrtillocactus cochal*, add to illustrations: Thomas, Zimmerkultur Kakteen 13, as *Cereus cochal.*

On page 183, vol. II, insert the following:

39. NEOABBOTTIA Britton and Rose, Smiths. Misc. Coll. 72^{9}: 2. 1921.

A tree-like cactus with a smooth, upright, terete trunk and a much branched top, the branches strongly winged or ribbed, normally from distal end of preceeding branch, but sometimes from below tip and usually in the same plane; ribs thin and high, very spiny; flowers nocturnal, small, tubular, with a narrow limb, borne several together at distal end of a terminal branch from a small, felted cephalium; perianth persisting on the ovary; perianth-tube and ovary bearing small scales with short wool and an occasional bristle in their axils; perianth-segments very small; throat of flower a little broadened at top, bearing many stamens; style slender; fruit oblong, turgid, nearly naked, deeply umbilicate; seed minute, black, muricate.



FIGS. 256, 257.—Flower and fruit of Neoabbottia paniculata. Natural size.

Type species: *Cactus paniculatus* Lamarck.

A monotypic genus of Hispaniola, dedicated to Dr. W. L. Abbott, a patron of natural history.

1. Neoabbottia paniculata (Lamarck) Britton and Rose, Smiths. Misc. Coll. 72^{9}: 3. 1921.

Cactus paniculatus Lamarck, Encycl. *1:* 540. 1783.
Cereus paniculatus De Candolle, Prodr. *3:* 466. 1828.

Plant 6 to 10 meters high or higher; trunk woody, 30 cm. in diameter, the wood close-grained, yellowish white; bark of trunk 1.5 cm. thick, brown, not spiny in age, smooth; branches 4 to 6 cm. broad, strongly 4-ribbed, occasionally 6-ribbed or winged; ribs thin, 1.5 to 2.5 cm. high, their margins somewhat crenate, areoles borne at base of sinuses, 1.5 to 2 cm. apart; spines 12 to 20, acicular, brownish to gray, 2 cm. long or less; cephalium 1 to 1.5 cm. in diameter, becoming elongated and angled; flowers straight, 5 cm. long, with a limb about 3 cm. broad, tube 6 to 7 mm. long, about 18 mm. in diameter, with walls 5 to 6 mm. thick; inner perianth-segments greenish white, short-oblong, about 1 cm. long, obtuse; throat 18 mm. long, covered with numerous filaments, these with a knee near base and pressing against style; stamens and style included; ovary and flower-tube tubercled, the former with short tubercles, the latter with oblong ones (sometimes 1.5 cm. long), each ending in a depressed areole subtended by a minute scale; areoles bearing a tuft of brown felt and an occasional brown bristle; fruit oblong in outline, 6 to 7 cm. long, 4 to 5.5 cm. in diameter, turgid, nearly naked; rind green, thick, hard; seeds rounded above, cuneate at base, with a large lateral depressed hilum.

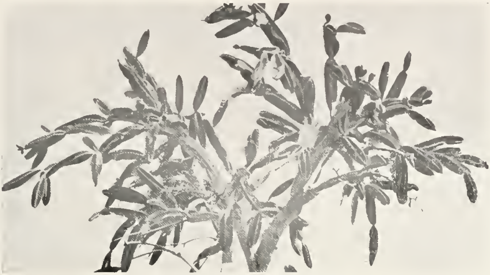


FIG. 258.—Neoabbottia paniculata.

Type locality: Haiti.

Distribution: Hispaniola.

This plant was described by Plumier as follows: "*Melocactus* arborescens, tetragonus, flore ex albido." This description was repeated by Tournefort, with the addition of a single word, in 1719. Plumier's drawing of this plant was published long after his death by Burmann as plate 192 of the Plantarum Americanum, and upon this plate Lamarck based his *Cactus paniculatus,* which De Candolle a little later took up as *Cereus paniculatus.* Ever since, the plant has usually passed under the latter name, with an occasional reversal to the earlier one.

Until recently, the species has been known only from this old illustration and these brief descriptions. It was collected near Port-au-Prince, Haiti, on the Cul-de-sac, by Dr. W. L. Abbott and Mr. E. C. Leonard, April 1920 (No. 3500); also at the same locality by Mr. H. M. Pilkington, December 1920; also a single branch by Dr. Paul Bartsch at Thomazeau in 1917 (No. 221). The Abbott and Leonard material consists of wood-sections and herbarium specimens of branches, flowers, fruit, and seeds, supplemented by living specimens and by fruit and flowers in formalin, together with several habit photographs.

In habit it resembles *Dendrocereus,* its branches resemble *Acanthocereus,* and the small limb of the flower resembles *Leptocereus;* but the plant differs from all of these in bearing several flowers at the ends of terminal branches and in developing a kind of cephalium. In the last respect it approaches *Neoraimondia,* near which we would place it in our present classification.

Illustrations: Smiths. Misc. Coll. **72**^{9}**:** pl. 1 to 4; pl. 2, f. 1, 2; Bull. Amer. Mus. Nat. Hist. **33:** 31. f. 11.

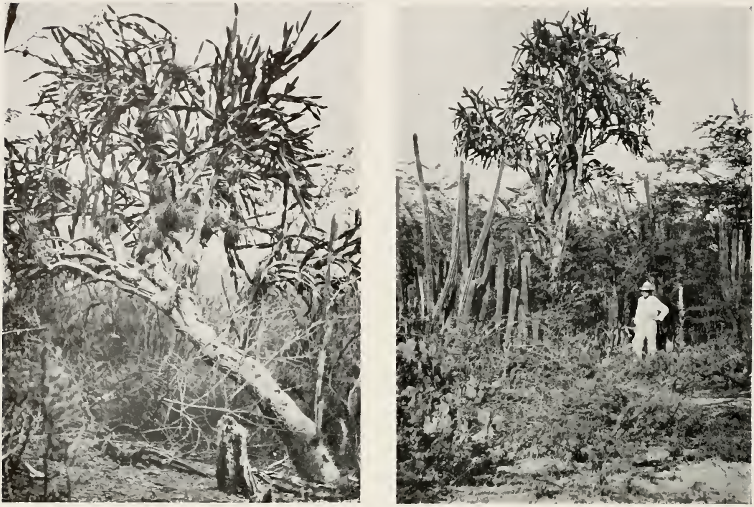
Figures 256 and 257 show the flower and fruit; figure 258 shows the top of a tree; figures 259 and 260 show the plant in its natural surroundings; figure 223*a*, page 248, is a reproduction of Plumier's plate.

On page 187, vol. II, under *Hylocereus undatus,* add to illustrations: De Laet, Cat. Gén. f. 31; Tribune Hort. **4:** pl. 140; Blanc, Cacti 37. No. 346; Ann. Inst. Roy. Hort. Fromont **2:**

pl. 1, f. D; Gartenwelt **11**: 101; Watson, Cact. Cult. ed. 3. pl. opp. 29; Rev. Hort. Belg. **40**: after 184; Meehans' Monthly **6**: 5; West Amer. Sci. **13**: 5; Gartenflora **55**: f. 2, as *Cereus triangularis;* De Tussac, Fl. Antill. **4**: pl. 26, as *Cactus triangularis;* Stand. Cycl. Hort. Bailey **3**: pl. 57, as *Hylocereus tricostatus;* Cañizares, Jard. Bot. Inst. Habana 98, as *H. triangularis.*

On page 189, vol. II, under *Hylocereus lemairei,* add to illustrations: Blühende Kakteen **3**: pl. 173, as *Cereus lemairei.*

On page 191, vol. II, under *Hylocereus napoleonis,* add to illustrations: Hartinger, Parad. **2**: 1, as *Cereus napoleonis.*



Figs. 259 and 260.—Neoabbottia paniculata.

On page 192, vol. II, under *Hylocereus triangularis,* insert: The name *Cactus anizogonus* of English gardens is given as a synonym of *Cereus triangularis* by Rümpler (Förster, Handb. Cact. ed. 2. 764. 1885).

On page 192, vol. II, under *Hylocereus trigonus* insert: *Cereus triqueter* Haworth (Syn. Pl. Succ. 181. 1812) is some species of *Hylocereus* near *H. trigonus.* If really from South America, as stated by Haworth, it may be the same as *H. lemairei.*

On page 194, vol. II, under *Hylocereus* sp., insert after first paragraph: This species of *Hylocereus* from the Guianas should be studied in connection with *Cereus scandens* Salm-Dyck (Cact. Hort. Dyck. 1849. 219. 1850), which is said to have come from Guiana. The variety *C. scandens minor* Boerhaave (Monatsschr. Kakteenk. **1**: 82. 1891) is only mentioned.

After page proof had been read, some fine specimens of a *Hylocereus* were received from Surinam through Gerold Stahel, which we describe as follows:

Stems much elongated, 3-angled, 2 to 6 cm. broad, bluish or whitened, somewhat glaucous; ribs often thin; margins of ribs not horny, nearly straight, areoles distant, sometimes 6 cm. apart; spines brown, 2 or 3, very short, much swollen at base.

In the shape, number, and size of spines this specimen resembles *H. lemairei*, but differs from it in the whitened stems. We do not know its flowers.

On page 197, vol. II, under *Selenicereus grandiflorus*, insert: *Cereus haitiensis* Hortus is cited by Schelle (Handb. Kakteenk. 89. 1907) as a synonym of *C. grandiflorus*.

Cereus grandiflorus flemingii Rümpler (Förster, Handb. Cact. ed. 2. 751. 1885; *C. flemingii*, Monatsschr. Kakteenk. **3:** 109. 1893) is said to be a hybrid between *C. grandiflorus* and *C. speciosissimus*.

Add to illustrations: Fl. Serr. **3:** pl. 1-2, as *Cereus grandifloro-speciosissimus;* Balt. Cact. Journ. **1:** 56, as queen of the night; Remark, Kakteenfreund 8; Gartenflora **42:** 541. f. 110; **64:** 90. f. 22; Gartenwelt **16:** 613; **19:** 18; Gard. Chron. III. **14:** 187. f. 36; Thomas, Zimmerkultur Kakteen 15; Tribune Hort. **4:** pl. 139; Blanc, Cacti 32; De Laet, Cat. Gén. f. 29; Fl. Serr. **3:** 233-234; Weinberg, Cacti 8; Knippel, Kakteen pl. 1; Goebel, Pflanz. Schild. **1:** pl. 2. f. 5; Möllers Deutsche Gärt. Zeit. **14:** 340 to 343; **20:** 561, as *Cereus grandiflorus;* Cañizares, Jard. Bot. Inst. Habana 100.

On page 198, vol. II, under *Selenicereus urbanianus*, add to illustrations: Gartenwelt **12:** 255, as *Cereus urbanianus;* Roig, Cact. Fl. Cub. pl. [3,] f. 2; pl. [4], as *Selenicereus maxonii*.

On page 199, vol. II, under *Selenicereus coniflorus*, insert: Dr. J. K. Small finds this plant naturalized in pinelands near the Everglades, west of Halenville, Florida.

On page 200, vol. II, under *Selenicereus pteranthus*, also add to illustrations: Garden **13:** 291; Monatsschr. Kakteenk. **31:** 71; Watson, Cact. Cult. 63. f. 15; ed. 3. f. 10; Gartenflora **41:** f. 23, 24, as *Cereus nycticalus*.

Add the synonym: *Cereus nycticalus peanii* Beguin in Riccoboni, Boll. R. Ort. Bot. Giard. Col. Palermo **8:** 252. 1909.

On page 202, vol. II, under *Selencereus boeckmannii*, add to illustration: Blühende Kakteen **3:** pl. 175, 176, as *Cereus boeckmannii*.

On page 202, vol. II, under *Selenicereus macdonaldiae*, add the synonym: *Cereus grandiflorus macdonaldiae* Blanc, Cacti 34.

Also insert: *Cereus kewensis* Worsley (Journ. Roy. Hort. Soc. **39:** 92. 1913) is said to be a "garden hybrid between *C. macdonaldiae* and probably *C. nycticalus*."

Also add to illustrations: Blanc, Cacti 34. No. 206, as *Cereus grandiflorus macdonaldiae;* Monatsschr. Kakteenk. **30:** 107; Gartenwelt **16:** 537; Möllers Deutsche Gärt. Zeit. **25:** 488. f. 22, No. 6, as *Cereus macdonaldiae*. Blühende Kakteen **3:** pl. 166, 167, as *Cereus grusonianus*.

Insert: *Cereus rothii* Weingart (Monatsschr. Kakteenk. **32:** 146. 1922) is of this relationship. It is a new name for the plant from South America called *Cereus macdonaldiae* by Spegazzini; we have not seen it.

On page 204, vol. II, under *Selenicereus hamatus*, add to illustrations: Tribune Hort. **4:** pl. 140; Floralia **42:** 371, as *Cereus rostratus*.

On page 209, vol. II, insert the following:

17. Selenicereus nelsonii (Weingart).

Cereus nelsonii Weingart, Zeitschrift Sukkulentenkunde *1:* 33. 1823.

A slender, much branched vine, 1 to 1.5 cm. in diameter, giving off occasional aërial roots; ribs 6 or 7, low, somewhat tubercled; areoles small, circular, about 1 cm. apart; spines about 12, acicular, white to yellowish, 5 to 7 mm. long; length of flower including ovary and closed perianth about 20 cm.; outer perianth-segments linear, pointed, reddish brown, the inner perianth-segments narrowly lanceolate, 7 cm. long, 12 to 15 mm. broad, acute; filaments numerous, weak, white; style long and slender, exserted beyond the withering perianth; stigma-lobes slender, white, entire; scales on the ovary and flower-tube minute, 1 to 1.5 mm. long, reddish brown, bearing white felt and white bristles in their axils; fruit crowned by the withering perianth, globular, 2 to 2.5 cm. in diameter, reddish, bearing numerous, small, circular areoles, these with clusters of acicular spines sometimes 1 cm. long.

Type locality: Southern Mexico.

Distribution: Mexico, but range not known.

We have had this plant under observation since 1914 when cuttings were sent us by C. Z. Nelson, an enthusiastic grower of cacti at Galesburg, Illinois, who obtained it from southern Mexico from Dr. J. L. Slater. This plant made two flowers during the week of May 17, 1922; the fruit ripens very slowly and did not mature until October 10, 1922.

According to Wilhelm Weingart, the same species has long been grown by Frantz de Laet at Contich, Belgium, also from Mexican material.

Illustration: Zeitschrift Sukkulentenk. **1:** 33, as *Cereus nelsonii.*

Figure 261 shows a branch bearing a newly matured fruit.

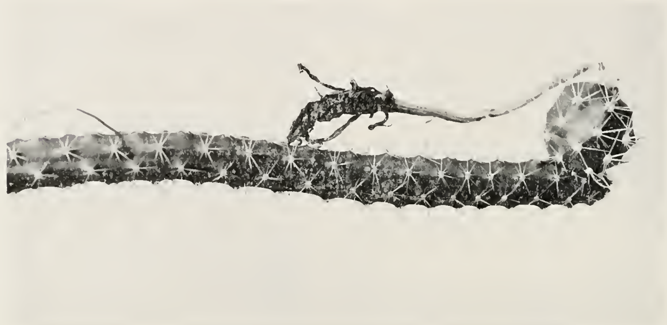


FIG. 261.—Selenicereus nelsonii.

On page 216, vol. II, under *Werckleocereus tonduzii,* add: *Illustration:* Monatsschr. Kakteenk. **31:** 85, as *Cereus tonduzii.*

On page 218, vol. II, under *Aporocactus leptophis,* add to illustrations: Ann. Fl. Pom. **1839:** pl. 43, as *Cereus leptophis.*

On page 219, vol. II, under *Aporocactus flagelliformis,* add to illustrations: Tribune Hort. **1:** pl. 4, as *Cereus serpentinus;* Fl. Antill. **1:** pl. 67, as cierge queue de souris; Cact. Journ. **1:** 82; Rother, Praktischer Leitfaden Kakteen 57; Remark, Kakteenfreund 6; Watson, Cact. Cult. ed. 3. f. 11; Floralia **42:** 371; Gartenwelt **15:** 637; Blanc. Cacti 27. No. 104; Amer. Gard. 11: 527 as *Cereus flagelliformis;* Cact. Journ. **1:** 125; **2:** 34; **2:** 153, as *C. flagelliformis cristatus.*

Insert: *Cereus smithianus* is a hybrid listed by Sweet (Hort. Brit. ed. 2. 237. 1830) which the Index Kewensis refers to *C. smithii,* a generic hybrid already referred to.

On page 221, vol. II, under *Aporocactus martianus,* add to the illustrations: Thomas, Zimmerkultur Kakteen 14, as *Cereus martianus.*

CORRECTIONS AND ADDITIONS TO VOLUME III.

On page 6, vol. III, under *Echinocereus scheeri,* add to illustrations: Thomas, Zimmerkultur Kakteen 27.

On page 7, vol. III, under *Echinocereus salm-dyckianus,* add to illustrations: Thomas, Zimmerkultur Kakteen 25.

On page 11, vol. III, under *Echinocereus polyacanthus,* add to illustrations: Förster, Handb. Cact. ed. 2. 212. f. 19, as *Cereus polyacanthus*; Floralia **42:** 376, as *Echinocereus polyacanthus* var.; Thomas, Zimmerkultur Kakteen 29; De Laet, Cat. Gén. f. 34, 37, 38; Möllers Deutsche Gärt. Zeit. **36:** 145. f. III; Succulenta **5:** 74.

On page 12, vol. III, under *Echinocereus acifer,* add to illustrations: Thomas, Zimmerkultur Kakteen 26, as *Echinocereus acifer trichacanthus;* Blühende Kakteen **3:** pl. 179, as *E. durangensis.*

On page 14, vol. III, under *Echinocereus coccineus,* add to illustrations: Pac. R. Rep. **4:** pl. 4, f. 1 to 3, as *Cereus phoeniceus.*

On page 17, vol. III, under *Echinocereus viridiflorus,* add the synonym: *Cereus viridiflorus minor* Engelmann, Proc. Amer. Acad. **3:** 278. 1856.

On page 21, vol. III, under *Echinocereus blanckii,* add to illustrations: Watson, Cact. Cult. 70. f. 18, as *Cereus blankii;* Watson, Cact. Cult. 68. f. 17; ed. 3. f. 13, as *C. berlandieri.*

On page 22, vol. III, under *Echinocereus pentalophus,* add to illustrations: Watson, Cact. Cult. 78. f. 23, as *Cereus leptacanthus;* Watson, Cact. Cult. 83. f. 27; ed. 3. f. 18, as *C. procumbens;* Balt. Cact. Journ. **2:** 218, as *Echinocereus procumbens.*

Also add the synonym: *Cereus propinquus subarticulatus* Pfeiffer in Förster, Handb. Cact. 373. 1846.

On page 23, vol. III, under *Echinocereus cinerascens,* insert: *Echinocactus deppii* Link and Otto (Steudel, Nom. ed. 2. **1:** 536. 1840) was given in error for *Echinocereus deppei.*

On page 25, vol. III, under *Echinocereus reichenbachii,* insert: Watson, Cact. Cult. ed. 3. f. 14, as *Cereus caespitosus;* West Amer. Sci. **7:** 237; **13:** 14; Gartenflora **23:** pl. 813, as *C. pectinatus;* Remark, Kakteenfreund 17; Balt. Cact. Journ. **2:** 218, as *Echinocereus caespitosus.*

On page 37, vol. III, under *Echinocereus enneacanthus,* add to illustrations: Bull. Univ. Tex. **60:** pl. 11, f. 1, as *Cereus longispinus;* Watson, Cact. Cult. 75. f. 21; ed. 3. f. 15, as *C. enneacanthus.*

Also insert: *Echinocereus saltillensis* is offered for sale by Haage and Schmidt, 1920, page 75.

Mr. C. R. Orcutt has called our attention to the following varieties which have been omitted: *Cereus engelmannii* var. *albispinus* Cels, var. *caespitosus,* var. *fulvispinus* Cels, var. *pfersdorffii* Heiden, all of which are listed by him (Orcutt, Rev. Cact. **1:** 13. 1897).

On page 45, vol. III, insert: The name *Cactus bertini* was given for this plant when awarded a silver medal soon after its discovery (Hort. Franc. II. **5:** 222).

On page 45, vol. III, *Rebutia minuscula,* add to illustrations: Succulenta **3:** 96; Thomas, Zimmerkultur Kakteen 34; Kaktusy 25, as *Echinocactus minusculus.*

On page 48, vol. III, under *Chamaecereus silvestrii,* add to illustrations: Blühende Kakteen **3:** pl. 168, as *Cereus silvestrii.*

On page 48, vol. III, substitute for *Echinopsis deminuta.*

5. Rebutia deminuta (Weber).

Echinopsis deminuta Weber, Bull. Mus. Hist. Nat. Paris *10:* 386. 1904.

Through the kindness of J. J. Verbeek Wolthuys, we have been able to examine a flower of this plant which shows that it belongs to the genus *Rebutia.*

On page 54, vol. III, under *Lobivia pentlandii,* add to illustrations: Watson, Cact. Cult. ed. 3. f. 32, as *Echinopsis pentlandii.*

On page 59, vol. III, insert the following:

21. Lobivia famatimensis (Spegazzini).

Echinocactus famatimensis Spegazzini, Anal. Soc. Cient. Argentina 92: 44. 1921.

Solitary or in clusters, short-cylindric, 3 to 3.5 cm. high, 2.5 to 2.8 cm. in diameter, strongly umbilicate at apex; ribs 24, low, obtuse, somewhat tuberculate; areoles approximate; spines small, appressed, whitish; flowers solitary, from the side near the middle, about 3 cm. long.

Type locality: Near Famatima, Argentina, altitude 2,000 to 3,000 meters.

Distribution: Province of La Rioja, Argentina.

Illustration: Anal. Soc. Cient. Argentina **92:** f. 9, as *Echinocactus famatimensis.*

On page 64, vol. III, under *Echinopsis multiplex,* add to illustrations: Watson, Cact. Cult. ed. 3. f. 16, as *Cereus multiplex;* Rev. Hort. **48:** 13. f. 1, as *Echinocactus multiplex;* Rev. Hort. **48:** 13. f. 2, as *E. multiplex cristata;* Gard. Chron. III. **56:** 145. f. 60.

On page 65, vol. III, under *Echinopsis oxygona,* add to illustrations: Thomas, Zimmerkultur Kakteen 23, as *Echinopsis oxygona inermis;* Succulenta **5:** 85.

On page 66, vol. III, under *Echinopsis eyriesii,* add to illustrations: Rother, Praktischer Leitfaden Kakteen 47, as *Echinopsis triumphans;* Remark, Kakteenfreund 9; Rother, Praktischer Leitfaden Kakteen 45, 106.

On page 67, vol. III, under *Echinopsis turbinata,* add to illustrations: Watson, Cact. Cult. 131. f. 50; ed. 3. f. 30; Gard. Chron. III. **16:** 625. f. 79, as *Echinopsis decaisneana;* Floralia **42:** 374, as *E. gemmata.*

On page 67, vol. III, under *Echinopsis tubiflora,* add to illustrations: Thomas, Zimmerkultur Kakteen 20, as *Echinopsis tubiflora rohlandii;* Rother, Praktischer Leitfaden Kakteen 44, as *E. zuccariniana.*

On page 72, vol. III, under *Echinopsis leucantha,* add to illustrations: Thomas, Zimmerkultur Kakteen 21.

On page 74, vol. III, under *Echinopsis bridgesii,* insert: *Illustration:* Möllers Deutsche Gärt. Zeit. **25:** 475. f. 7, No. 18, as *Echinopsis salmiana.*

On page 75, vol. III, under *Echinopsis formosa,* add to illustrations: Monatsschr. Kakteenk. **32:** 149.

On page 76, vol. III, *Echinopsis formosissima,* insert: *Cereus formosissimus* Weber (Dict. Hort. Bois 471. 1896) was cited by Weber as a synonym of this species.

On page 80, vol. III, under *Ariocarpus retusus,* add the synonyms: *Cactus areolosus* Kuntze, Rev. Gen. Pl. **1:** 260. 1891; *Cactus pulvilliger* Kuntze, Rev. Gen. Pl. **1:** 260. 1891.

Add to illustrations: Monatsschr. Kakteenk. **23:** 66, 67, as *Ariocarpus trigonus.*

On page 82, vol. III, under *Ariocarpus kotschoubeyanus* insert: *Anhalonium kotschubeyi* Lemaire (Salm-Dyck, Cact. Hort. Dyck. 1849. 5. 1850), given as a synonym of *A. sulcatum,* is to be referred here.

On page 83, vol. III, under *Ariocarpus fissuratus,* add to illustrations: Bull Univ. Texas **60:** pl. 11, f. 2, as *Ariocarpus fissuratas;* Gard. Chron. III. **12:** 789. f. 130; Watson, Cact. Cult. 161. f. 61, as *Mammillaria fissurata;* Watson Cact. Cult. ed. 3. f. 6, as *Anhalonium engelmannii;* Remark, Kakteenfreund 10; Balt. Cact. Journ. **1:** 27; **2:** 247, as *Anhalonium fissuratum;* Rother, Praktischer Leitfaden Kakteen 35.

On page 85, vol. III, under *Lophophora williamsii,* add to illustrations: Sci. Amer. **124:** 492, as mescal button; Rother, Praktischer Leitfaden Kakteen 36; Remark, Kakteenfreund 11; Karsten and Schenck, Vegetationsbilder 2: pl. 20, B; Thomas, Zimmerkultur Kakteen 30; Monatsschr. Kakteen. **31:** 187, as *Echinocactus williamsii;* Balt. Cact. Journ. **1:** 71; **2:** 247; Watson, Cact. Cult. ed. 2. 243. f. 91; ed. 3. f. 7, as *Anhalonium williamsii;* Succulenta **2:** 3; **4:** 7.

On page 91, vol. III, under *Pediocactus simpsonii,* add to illustrations: Wiener Obst. Zeit. **2:** 90. f. 13; Remark, Kakteenfreund 13, as *Echinocactus simpsonii.*

On page 106, vol. III, under *Hamatocactus setispinus*, add to illustrations: Schulz, 500 Wild Fl. San Antonio pl. 12, as *Echinocactus setispinus*.

On page 107, vol. III, under *Strombocactus disciformis*, add to illustrations: Remark, Kakteenfreund 12, as *Echinocactus turbiniformis*.

On page 123, vol. III, at end of *Echinofossulocactus*, insert the following:

Echinocactus tetracentrus Lemaire (Cact. Gen. Nov. Sp. 31. 1839) has not been identified. It is to be referred to one of the species of *Echinofossulocactus*.

Echinocactus barcelona (Cact. Journ. **2**: 79, 175, 191) was offered for sale by F. A. Walton.

On page 124, vol. III, under *Ferocactus stainesii*, insert: *Echinocactus pilosus canescens* Scheidweiler is listed in Index Bibliographique (286. 1887).

On page 129, vol. III, under *Ferocactus lecontei*, insert: *Echinocactus leopoldii* (Belg. Hort. **25**: 132. 1876) was only breifly described when awarded a prize in Belgium. Schumann referred it as a synonym of *E. cylindraceus*, while De Laet, who saw the plant, thought it was a form of *Ferocactus lecontei*. It is misspelled in Volume III.

Add to illustrations: Wiener Ill. Gart. Zeit. **11**: pl. 3, in part; Thomas, Zimmerkultur Kakteen 32; Watson, Cact. Cult. ed. 3. f. 26, as *Echinocactus lecontei*.

On page 130, vol. III, under *Ferocactus acanthodes*, add to illustrations: Thomas, Zimmerkultur Kakteen 40, as *Echinocactus cylindraceus*.

On page 132, vol. III, insert:

11a. **Ferocactus johnstonianus** Britton and Rose, sp. nov.

Plants simple, short-cylindric, 6 dm. high or less, up to 3.5 dm. in diameter; ribs 24 to 31, with margins undulate; areoles elliptic, rather closely set; spines 20 or more, subulate, very much alike, none hooked, slightly spreading and more or less outwardly recurved, 7 cm. long or less, yellow to brownish yellow, annulate; flowers including ovary 5 cm. long; perianth-segments narrow, yellowish, or the outer ones tinged with red, short-acuminate, the margins slightly erose; filaments yellowish below, becoming reddish above; stigma-lobes 8 to 13, flesh-colored; scales on the ovary orbicular; fruit small, 2.5 cm. in diameter, the seed dehiscing by a large pore at the base; seeds angled, black, pitted, 2 mm. long; hilum small, circular, depressed, white.

Collected by Ivan M. Johnston at Angel de la Guardia Island, Lower California May 2, 1921 (Nos. 3394, type, and 3395).

This species is perhaps nearest *Ferocactus diguetii* but is much smaller and has fewer ribs, many more spines in a cluster, and yellow flowers.

On page 140, vol. III, under *Ferocactus viridescens*, add to illustrations: Blühende Kakteen **3**: pl. 177, as *Echinocactus viridescens*.

On page 143, vol. III, under *Ferocactus latispinus*, add to illustrations: Remark, Kakteenfreund 13, as *Echinocactus cornigerus flavispinus*.

Also add the note: *Cactus cornigereus* Mociño and Sessé (De Candolle, Prodr. **3**: 461. 1828) is given as a synonym of *Echinocactus cornigerus*.

On page 144, vol. III, under *Ferocactus hamatacanthus*, add to illustrations: Rother, Praktischer Leitfaden Kakteen 106, as *Echinocactus longihamatus*.

On page 148, vol. III, under *Echinomastus erectocentrus*, insert: Mr. C. R. Orcutt has called our attention to the fact that in *Echinomastus erectocentrus* the fruit opens by splitting down one side, and in this respect differs from our generic description. This character in the description was drawn from a study of the fruits of *E. intertextus*, the only species in this genus of which we know much about the fruit. He also states that the fruit of *Astrophytum myriostigma* splits open on one side, an observation we had not recorded.

On page 150, vol. III, under *Echinomastus unguispinus*, add to illustrations: Thomas, Zimmerkultur Kakteen 31; Schelle, Handb. Kakteenk. 200. f. 132, as *Echinocactus unguispinus*.

On page 155, vol. III, under *Gymnocalycium denudatum*, insert: *Echinocactus denudatus multiflorus* (Monatsschr. Kakteenk. **14:** 178) is only a name.

Also add to illustrations: Thomas, Zimmerkultur Kakteen 41, as *Echinocactus denudatus.*

On page 157, vol. III, under *Gymnocalycium saglione*, add to illustrations: Thomas, Zimmerkultur 37, as *Echinocactus saglionis.*

On page 158, vol. III, under *Gymnocalycium gibbosum* add to illustrations: Van Géel, Sert. Bot. **1:** 113, as *Cactus gibbosus.*

On page 159, vol. III, under *Gymnocalycium brachyanthum*, insert: *Illustration:* Möllers Deutsche Gärt. Zeit. **36:** 145. No. 11, as *Echinocactus brachyanthus.*

On page 161, vol. III, under *Gymnocalycium monvillei*, add to illustrations: Möllers Deutsche Gärt. Zeit. **36:** 145. f. 1, as *Echinocactus monvillei.*

On page 168, vol. III, under *Echinocactus grusonii*, add to illustrations: Watson, Cact. Cult. ed. 3. f. 23; Rother, Praktischer Leitfaden Kakteen 30; Deutsche Garten-Zeitung 28. f. 6; Zeitschrift Sukkulentk. **1:** 15.

On page 168, vol. III, under *Echinocactus ingens*, add to illustrations: Remark, Kakteenfreund 14.

On page 171, vol. III, under *Echinocactus visnaga*, add to illustrations: Balt. Cact. Journ. **2:** 181.

On page 181, vol. III, insert the following paragraphs:

Echinocactus acutispinus Hildmann (Deutsche Garten-Zeitung **1886:** 116. f. 27. 1886) was described and figured, but the plant is a small, barren one which we have not been able to associate with any described species. It came from Mexico and may be one of the species of *Echinocactus.*

Echinocactus cylindricus Hortus (Forbes, Hort. Tour Germ. 152) was described as cylindrical, with 12 or 13 ribs, the radial spines white and the central ones light brown. It was introduced from Mexico in 1836. It can not be identified.

On page 182, vol. III, under *Homalocephala texensis*, add to illustrations: Schulz, 500 Wild Flowers of San Antonio, pl. 13 in part as *Echinocactus texensis.*

Echinocactus darrahii Schumann (Monatsschr. Kakteenk. **12:** 21. 1902) is only mentioned.

Echinocactus dicracanthus Hortus (Forbes, Journ. Hort. Tour Germ. 160) is only a name.

Echinocactus inflatus Gillies (Steudel, Nom. ed. 2. **1:** 536. 1840) seems never to have been published. Steudel simply states that it was from Chile.

Echinocactus praegnacanthus Förster (Handb. Gartenz. 17: 160. 1861) is a plant from Chile which has never been identified.

Echinocactus purpureus (Monatsschr. Kakteenk. **5:** 106. 1895) is listed by Schumann as in Gruson's Garden.

Echinocactus rhodanthus (Forbes, Journ. Hort. Tour Germ. 151) is only a name.

On page 182, vol. III, under *Astrophytum myriostigma*, add to illustrations: Remark, Kakteenfreund 11; Balt. Cact. Journ. **1:** 82.

On page 185, vol. III, under *Astrophytum capricorne*, add to illustrations: Remark, Kakteenfreund 12, as *Echinocactus capricornis.*

On page 188, vol. III, under *Malacocarpus tephracanthus*, add the synonym: *Echinocactus sellowii tetracanthus* Lemaire in Schumann, Monatsschr. Kakteenk. **18:** 150. 1908.

Insert: *Echinocactus buchheimianus* Haage in Quehl (Monatsschr. Kakteenk. **9:** 74. 1899) has been described briefly but its flower and fruit are unknown. It is said to resemble *E. sellowii.*

Add to illustrations: Schumann, Gesamtb. Kakteen f. 15, as *Cereus tephracanthus*.

On page 193, vol. III, under *Malacocarpus concinnus,* add to illustrations: Succulenta **3**: 22, 48, as *Echinocactus concinnus*.

On page 193, vol. III, under *Malacocarpus scopa,* add to illustrations: Rother, Praktischer Leitfaden Kakteen 107, as *Echinocactus scopa cristatus;* Kaktusy 26, as *Echinocactus scopa;* Kaktusy 27, as *E. scopa cristata;* Kaktusy 28, as *E. scopa rubra*.

On page 195, vol. III, under *Malacocarpus linkii,* insert: *Echinocactus ottonis linkii* Hortus (Förster, Handb. Cact. ed. 2. 554. 1885) is given as a synonym of *E. linkii*.

On page 196, vol. III, under *Malacocarpus ottonis,* add to illustrations: Succulenta **3**: 56, as *Echinocactus ottonis tenuispinus;* Rother, Praktischer Leitfaden Kakteen 34, as *E. ottonis*.

On page 198, vol. III, under *Malacocarpus erinaceus,* add to illustrations: Watson, Cact. Cult. 98. f. 32, as *Echinocactus corynodes*.

On page 200, vol. III, under *Malacocarpus mammulosus,* add to illustrations: Rother, Praktischer Leitfaden Kakteen 30, as *Echinocactus shaselbergii.* add to illustrations: Succulenta **3**: 31, as *Echinocactus haselbergii*.

On page 202 ,vol. III, under *Malacocarpus ubmammulosus*.

On page 205, vol. III, under *Malacocarpus leninghausii,* add to illustrations: Succulenta **3**: 39, as *Echinocactus leninghausii*.

On page 207 ,vol. III, under *Hickenia microsperma,* add to illustrations: Succulenta **3**: 71; **5**: pl. 1; Thomas, Zimmerkultur Kakteen 35, as *Echinocactus microspermus*.

On page 237, vol. III, insert the following:

19. Cactus oaxacensis sp. nov.

Globular to ovoid, 12 to 15 cm. thick, with a small, low crown only 2 to 3 cm. high and 3 to 4 cm. broad; ribs 11 to 15, prominent, usually rounded; radial spines 8 to 12, subulate, more or less recurved at first, reddish brown but grayish in age, 2 cm. long or less; central spines 1 or sometimes 2, erect or porrect; flowers slender, about 2 cm. long, dark rose; filaments and style light yellow; fruit thick-clavate, 2 to 4.5 cm. long, scarlet, shiny; seeds small, black.

This plant was illustrated and mentioned in the place here cited (Cactaceae **3**: 237. f. 249) but was not given a specific name. Since then C. R. Orcutt reports finding it at Salina Cruz and Dr. B. P. Reko sends us a photograph and flowers obtained by him in 1923, while Dr. J. A. Purpus recollected it in 1923 (type) and has sent us living plants.

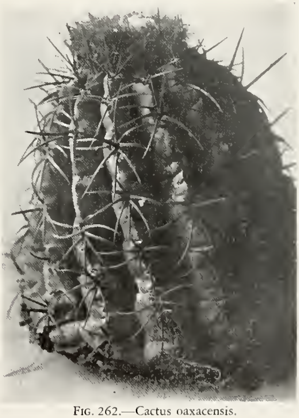


FIG. 262.—Cactus oaxacensis.

Illustration: Cactaceae **3**: 236. f. 249, as *Cactus* sp.

Figure 262 is from a photograph of the plant sent us by Dr. Reko.

On page 238, vol. III, insert: *Melocactus ellemeetii* Miquel (Nederl. Kruidk. Arch. **4**: 336. 1858) and *M. pachycentrus* Suringar (Verh. Akad. Wettensch. Amst. II. **8**: 28. 1901) have not been identified.

On page 238, vol. III, at end of *Cactus* add: *Cactus aculeatissimus* is listed by Steudel (Nom. 131. 1821) credited to Zeyher and cited by the Index Kewensis, but it has never been identified.

Cactus tuna major is used by Roxburgh (Hort. Beng. 37. 1814).

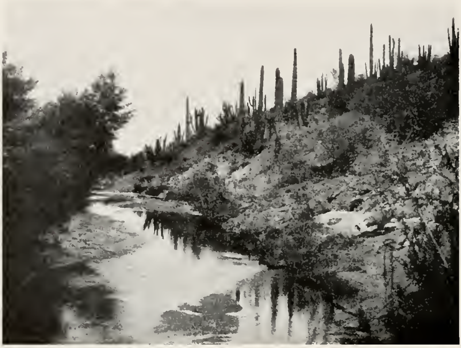
Cactus reptans Willdenow (Ann. Hort. Berol. Suppl. 33. 1813) was taken up in this work by mistake as *Cereus reptans.*

Cactus neglectus Dehnhardt (Rivist. Napol. 1. 3: 166.), according to the Index Kewensis, is a species of *Pereskia.*

Cereus erinaceus is credited to Haworth by Steudel (Nom. ed. 2. 1: 334. 1840) and said to come from the West Indies. Steudel must have had in mind *Cactus erinaceus* Haworth; if so, the plant is from South America.

Cereus torrellianus (Monatsschr. Kakteenk. 20: 42. 1910) is probably a misspelling for *C. tonelianus.*

Figure 263, shown below, gives a typical Arizona landscape in which *Carnegiea gigantea* is the dominant plant.



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